APPENDIX A

FIELD SAMPLING PLAN
FOR THE
SITE INVESTIGATION FOR
DEAD CREEK - SECTOR B, AND SITES L AND M,
SAUGET - CAHOKIA, ILLINOIS

GERAGHTY & MILLER, INC.

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APPENDIX A

**FIELD SAMPLING PLAN
FOR THE
SITE INVESTIGATION FOR
DEAD CREEK - SECTOR B, AND SITES L AND M,
SAUGET - CAHOKIA, ILLINOIS**

1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE

On behalf of the Monsanto Company, Geraghty & Miller, Inc. has prepared this Field Sampling Plan (FSP) for three selected sites associated with the area designated by the Illinois Environmental Protection Agency (IEPA) as Sauget Sites - Area I (Figure 1). These three sites are Dead Creek - Sector B, Site L, and Site M (Figure 2). The purpose of the investigation is to characterize the sites by determining the nature and extent of sediment/fill materials in the unsaturated zone in Sector B and Site L, and below the ponded water at Site M. This will be accomplished through the analysis of selected sediment/fill samples for the United States Environmental Protection Agency (USEPA) Target Compound List/Target Analyte List (TCL/TAL) and through analysis of the remaining samples for site specific compounds, such as polychlorinated biphenyls (PCBs), TAL metals, or TAL volatile organic compounds (VOCs). Once the nature and extent of the sediment/fill has been delineated, selected areas that best represent site conditions will be sampled and analyzed for reactivity, corrosivity, ignitability, and the list of constituents which are analyzed by the Toxicity Characteristic Leaching Procedure (TCLP) provided in Table 1.

The results from these analyses will be used to determine the volume of sediment/fill and whether it needs to be treated prior to disposal. The number of samples scheduled for

TCLP analysis will be based on the initial analytical (Phase I) results, however, it is anticipated that only about five samples will be required.

1.2 SITE DESCRIPTION AND BACKGROUND

A brief description of Dead Creek - Sector B, Site L, and Site M is provided below, along with a summary of prior investigations.

1.2.1 Dead Creek - Sector B

Dead Creek - Sector B is located between Queeny Avenue and Judith Lane (Figure 2). The culverts at both ends for Sector B have been sealed to prevent inflow or outflow from this area. The banks of the creek are heavily vegetated and debris is visible in the area. The site is enclosed within a chain-link fence without a gate. In general, the creek area consists of a narrow channel about 5 feet wide, which is flanked by low banks. The channel and low banks are enclosed by steeper banks on either side of the creek. Currently, the west side of the northern 400 feet of Sector B is not accessible due to the restrictions by the property's owner (see Figure 2).

In 1980, the IEPA conducted a study at Dead Creek which included the installation of monitoring wells and borings, and the collection of surface-water, ground-water and soil samples. A vertical profile of the creek sediments in the northern portion of Sector B, and soil samples collected at 17 other locations indicate the presence of metals, PCBs, and other organic compounds.

In 1986, Ecology & Environment, Inc. (E&E) conducted a Remedial Investigation (RI) for the IEPA at several sites in Sauget, including Sector B, and Sites L and M (see Figure 2). In Sector B, E&E collected two surface-water samples and five sediment samples; however, the sampling locations were restricted to the north and south ends of the study area. The data from these sampling points indicate that past uses of the creek have impacted the site. Constituents detected included metals and PCBs.

1.2.2 Site L

Site L is located on the east side of Dead Creek, approximately 700 feet south of Queeny Avenue (Figure 2). It is the former location of a surface impoundment used by a trucking company, who disposed of wash water from truck cleaning operations. Site L was determined by E&E to be located about 125 feet east of Dead Creek, and encompasses an area of approximately 70 feet by 150 feet. Currently, the site is covered with black cinders and is used for equipment storage by Metro Construction Equipment Company. Access to the site is not controlled. Surficial soil was not sampled by E&E.

In 1980, the IEPA installed a well downgradient of this area; however, due to faulty construction, it was replaced by E&E in 1986. In 1986, E&E drilled three soil borings, replaced the IEPA monitoring well, and conducted a soil-gas survey at Site L. The data from these sampling points indicate that past activities have impacted soil and ground water at the site. Compounds detected include benzene, toluene, phenols and arsenic. PCBs were not detected.

1.2.3 Site M

Site M is a former sand and gravel pit excavated between 1945 and 1950. The pit is approximately 275 feet by 300 feet and is filled with water. E&E estimated the pit's depth to be 40 feet. Site M is connected to Dead Creek - Sector B at the southwest corner of Site M (Figure 2). It is not known whether Site M was excavated into the water table. Other than miscellaneous trash, no other waste disposal was evident in the pit at the time of the E&E study. Access to the site is controlled by a chain-link fence.

In 1986, E&E collected two surface-water samples, five sediment samples, and soil-gas samples from the perimeter of Site M. Neither the surface-water samples nor the soil-gas samples indicated the presence of constituents of concern. The PCB data from the sediment samples indicated that past site activities may have impacted the site. In 1980, the IEPA collected two, unfiltered, surface-water samples and PCBs were detected at 4.4 ppm and 0.9 ppm.

2.0 SUBCONTRACTOR PROCUREMENT

Discussed below are the procedures for determining the laboratory and driller subcontractors.

2.1 LABORATORY SUBCONTRACTOR

A laboratory subcontractor will provide the analytical services for the field investigation. Geraghty & Miller will select a laboratory from among the current participants in our Analytical Quality Assurance/Laboratory Contract Program (AQA/LCP), with Monsanto's approval, to perform these services. This program was developed by Geraghty & Miller to ensure that high-quality laboratory services will be obtained and that project data quality objectives are achieved. Laboratories participating in the Geraghty & Miller AQA/LCP were audited prior to incorporation into the program and the following information was obtained:

1. Facilities (Are the premises clean, large enough, well organized, and properly constructed?)

2. Personnel (Do the staff have the right training and experience?)

3. Sample receiving, storage, and handling procedures

4. Sampling preparation procedures

5. Instrumentation and analytical procedures (Is there enough equipment and is it of the right type? Are procedures correct?)

6. Preventive maintenance

7. Data reduction and reporting (How are data generated, verified, and reported; what type of supervisory data review is in effect?)

8. QA/QC Procedures (Are they appropriate, and are they followed?)

9. Certifications (Does the laboratory participate in the USEPA Contract Laboratory Program [CLP] and/or state certification programs?)

10. Attitude (Has the laboratory indicated a willingness to provide attentive and timely service, are they flexible, and do they have a cooperative attitude?)

The laboratory selected to provide analytical services for the site investigation is Savannah Labs, Inc. of Savannah, Georgia.

2.2 DRILLING SUBCONTRACTOR

Three drilling subcontractors have been contacted to determine if they have adequate capabilities to conduct the field tasks in a timely manner. Based on their assessment of the sites and their estimated costs, one of these subcontractors will be selected. These drilling companies are John Mathes and Associates, Inc., Columbia, Illinois; Layne Western, Fenton, Missouri; and Hannibal Testing Laboratories, Inc., Hannibal, Missouri.

3.0 SEDIMENT/FILL BORING PROGRAMS

The operating procedures for drilling the borings in sediment/fill at each of the sites is provided below.

3.1 INTRODUCTION

At Dead Creek - Sector B, sediment/fill samples will be collected across ten profiles spaced approximately 200 feet apart within the creek bed. Three borings will be drilled along each profile, as shown in Figure 3. All borings will be drilled to determine the thickness of the sediment/fill in the creek and will be spaced about 15 to 20 feet apart. It is anticipated that the borings within the creek bed will be drilled to a maximum depth of about 7 feet. Samples will be collected using a 5-foot continuous tube sampler, however 3-inch diameter split-barrel core (split-spoons) samplers will be used if recovery is poor in the fine sandy sediments. Both methods will provide a continuous record of the geology, as well as a sufficient volume of material for analysis. All samples will be described by a Geraghty & Miller field geologist who will record sample location, depth, grain size distribution, and color. Each sample will also be screened in the field for the presence of VOCs using a photoionization detection (PID) instrument.

One sediment/fill sample per borehole will be selected for chemical analysis based on appearance and PID measurements. Each sample will be selected from the 2-foot interval that best characterizes sediment/fill in the creek. One sediment/fill sample per profile will be analyzed for USEPA TCL/TAL parameters, and the other two samples from each profile will be analyzed for TAL metals and PCBs. Appropriate QA/QC samples will also be collected as discussed in Section 3.7 (Quality Control). The analytical data from the sediment/fill will be used to delineate any impacted areas and to provide an estimate of the volume of sediment/fill that may require remediation. Each borehole will be sealed with a mixture of drill cuttings and bentonite grout, and the borehole's location and land surface elevation will be surveyed by an Illinois licensed land surveyor. All drilling equipment will be steam cleaned after each borehole and all sampling equipment will be decontaminated with a laboratory-grade detergent and potable water before the collection of each sample.

An all-terrain (ATV) drill rig will be used for the entire program. To provide suitable sampling conditions, it may be necessary to pump standing water out of some areas should it be present at the time the study is conducted. If necessary, the dry boring locations will be sampled first, then the water will be pumped into the area of the creek where the boring program has been completed. If there is too much water to transfer, portable equipment may be used, such as a tripod. In addition, the installation of a gate within Sector B's chain-link perimeter fence will be necessary for the drill rig and field crew.

To define the lateral and vertical extent of the fill material in Site L, six borings will be required to supplement the existing borings installed during the 1986 E&E investigation (Figure 4). To delineate the bottom of the fill at each boring location, continuous samples will be collected using a 5-foot tube sampler or a 3-inch diameter split spoon, as previously described. Five borings will be drilled at the perimeter of the former impoundment (as identified by E&E) to determine its actual boundaries. A visual determination by the field geologist will be used to determine whether or not the boring is within the former impoundment basin. If necessary, boring locations will be moved to determine the former impoundment basin boundary and to characterize the fill material. One boring will be drilled near the center of Site L to determine maximum fill thickness. One sample from each of the six boreholes that best characterizes the fill material will be submitted for laboratory analysis. Each sample will be obtained from a 2-foot section of the continuous core. Selection for analysis will be based on appearance and PID readings. At two of the six borings, the samples will be analyzed for TCL/TAL parameters. Based on existing data, the remaining four borings will undergo analysis for PCBs, TAL metals, and VOCs to determine the chemical nature of the fill material. Each borehole will be sealed and surveyed as described for Dead Creek - Sector B.

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At Site M, sediment samples will be collected from three locations beneath the ponded water (Figure 5). To obtain the samples, a soil boring drill rig supported by the aluminum pontoon described in Section 3.1 may be used, or samples may be collected from a boat. If the samples are collected from a boat, 4-inch steel casing will be driven into the sediments underlying the pond. A split-spoon sampler will be driven into the pond sediments and the underlying sand and gravel to determine the thickness of the sediment. One sample for laboratory analysis of sediment will be selected from the 0 to 2-foot depth interval at each of the three locations. At one location, the sample will be analyzed for TCL/TAL parameters. At the other two locations, samples will be analyzed for PCBs and TAL metals. For the purposes of this field plan, Geraghty & Miller will assume that the pit bottom is at a maximum depth of 10 feet below the pond level. Sample selection protocols and decontamination procedures will be the same as described for Dead Creek - Sector B.

3.2 AUGER DRILLING TECHNIQUE

This technique involves the use of ATV-mounted or tractor-mounted equipment capable of rotating a drill bit into the subsurface on a string of auger flights. Drill cuttings are continuously lifted to the surface on the outside of the flights while rods and a plug are used inside the hollow-stem flights to keep the formation material from entering the inside of the augers. The plug is removed for continuous tube or split-spoon sampling inside the flights.

3.3 CONTINUOUS TUBE/SPLIT-BARREL CORE SAMPLING

Continuous tube or split-barrel core samples of unconsolidated sediments will be collected through the auger flights prior to advancing the drill bit. Samples will be collected at continuous 5-foot increments using a 5-foot continuous tube sampler. The continuous tube sampler will be advanced into the formation ahead of the augers during drilling. If a split-spoon is used, it will be advanced by either applying hydraulic pressure or by dropping a conventional 140-pound hammer from a height of 30 inches onto the sampling assembly.

In addition to the drilling equipment, the following equipment will be used during the soil sampling program:

- Continuous tube sampler
- Split-barrel core sampler(s)
- Micro™ laboratory cleaner
- Brushes
- Plastic buckets
- Distilled water
- Plastic sheeting
- Stainless steel spatula
- Stainless steel pan
- Stainless steel coring device
- Table (optional)
- PID instrument
- Health and safety equipment (see HASP)
- Sample containers

A field hydrogeologist will keep a detailed sample/core log for each borehole including the date sampling occurred, and the location, depth, standard penetration test (blow counts), grain size, and color of the material recovered. The hydrogeologist will make sure that the sampling device is cleaned between sampling intervals in accordance with the protocols described below. As drilling continues, the hydrogeologist will monitor the drilling progress, describe the material taken from the borehole, and collect the samples. Either sampling device will be used in accordance with the following protocols:

1. A clean sampling device will be given to the driller (or helper) by the field hydrogeologist, both of whom will be wearing clean, disposable gloves.

2. The sample will then be collected by the driller using the appropriate method.

3. The field hydrogeologist will take the sampling device from the driller and place it on clean polyethylene sheeting.

4. The sampling device will be opened to expose the sample.

5. A clean spatula will be used to remove and discard the top 2 to 3 inches of the sample.

6. A stainless steel coring device will be used to collect two VOC samples. The coring device is a stainless steel barrel approximately 0.75-inches in diameter and 3-inches in length. The coring device will be inserted along the 2-foot length of the core selected for sampling. The sample will then be extruded into a 40 ml VOC vial. The 40 ml VOC vials will be filled to capacity sealed and placed on ice. This method of sample collection will ensure minimal disturbance of the sample.

7. The remainder of the core sample will be split down the middle. One-half of the sample will be placed in a jar, covered with aluminum foil and capped. The head space will be checked for total VOCs (TVOCs) as discussed in Section 3.3.1.

8. The remainder of the soil will be placed in a clean stainless steel pan and thoroughly mixed with a clean stainless steel spatula. The soil in the pan will be scraped from the sides, corners, and bottom of the pan, rolled to the middle of the pan, and mixed. The sample will then be quartered and moved to the four corners of the pan. Each quarter will then be mixed individually before being rolled to the center of the container and the entire sample mixed again. Once mixed, the sample will be placed in glass jars and stored on ice until the selection of samples for specific laboratory analysis is determined. The criteria for selection will be appearance, odor, and PID measurements, as described in Section 3.1. After the soil samples for laboratory analysis have been selected, the soil will be placed in the appropriate containers described in the QAPP (see Appendix B).

9. The sample label will be completed (project, location, depth, date), attached to the sample container, and covered with transparent tape.

10. The Geraghty & Miller sample/core log form will be completed (see appropriate form in Attachment A).

11. Each sample scheduled for laboratory analysis will be stored on ice at 4°C, preserved and shipped to the laboratory via overnight courier.

12. The sampling equipment will be decontaminated as described in Section 3.6.

3.3.1 Field Screening for Total Volatile Organic Compounds and Soil Sample Selection

The head space in each sample jar will be checked for TVOCs by a PID instrument (HNU, or TIP) to aid in the selection of samples for laboratory analysis. The procedure will be to allow the sample to equilibrate to room temperature, remove the lid, pierce the aluminum foil, and take a reading. Readings will be recorded on the sample/core log (see Attachment A). The air monitoring instrument will be calibrated according to the manufacturer's instructions.

3.4 SAMPLE CONTAINERS

For a complete list of sample containers, matrices, method numbers, container preservative, and analysis holding times, please refer to Table B-4 in the QAPP.

3.5 RECORD KEEPING

All Geraghty & Miller personnel involved in drilling and sample collection will carefully document the day's events and the handling history of all sediment/fill samples and blanks collected. Standard Geraghty & Miller forms (see Attachment A) will be completed to document the field work, and the integrity of each sample, from the time the drilling crew and field crew enter the site through sample collection and shipment.

3.5.1 Daily Log

Daily logs will be used by the field team for QA/QC purposes to record all sampling events and field observations (see Attachment A). Entries in the daily logs will be dated by the person making the entry, and the logs will be kept in a secure, dry place. The following types of information will be included on the log forms:

1. Date and time of arrival at site.

2. Client.

3. Location.

4. Weather.

5. Field crew and drill crew members.

6. Work progress.

7. QC samples.

8. Departure time.

Other miscellaneous information will also be recorded on the Geraghty & Miller Daily Log forms. Examples are as follows:

1. Delays.

2. Unusual situations.

3. Departure from established QA/QC field procedures.

4. Instrument problems.

5. Accidents.

3.5.2 Sample/Core Log

The field personnel will prepare a Geraghty & Miller Sample/Core Log for QA/QC purposes at the time of sampling to record information about each sample collected (see Attachment A). In addition to project information, the log will include the following information on sampling:

1. Date and time of sampling.

2. Physical appearance of samples.

3. Field observations.

4. Results of field analyses.

5. Sampling method and material.

6. Constituents sampled for.

7. Sample container and preservation.

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8. Sampling personnel.

3.5.3 Sample Labels and Chain-of-Custody Form

Sample labels are necessary for proper sample identification. The labels will be affixed to the sample containers prior to the time of sampling and will not be affixed to lids or caps. To track QA/QC handling protocols, the labels will be filled out by field personnel, and the Geraghty & Miller Chain-of-Custody form (Attachment A) will be completed in the field before the field crew leaves the site. Labels will include sample identification, project number, date and time collected, and analyses to be performed.

The field crew will be responsible for maintaining custody of the samples until they are delivered to the carrier or the laboratory. The Chain-of-Custody form will then be signed and custody formally relinquished. The containers (bearing custody seals) will be in view at all times or will be stored in a secure place restricted to authorized personnel.

3.6 DECONTAMINATION

The drill casings, rods, augers, samplers, tools, rig, and any piece of equipment that will come into contact (directly or indirectly) with the sediment/fill or geologic formation will be steam-cleaned on-site prior to drilling. The same steam-cleaning protocols will be followed at the completion of each borehole and before leaving the site at the end of the project. All on-site steam-cleaning activities will be monitored by the Geraghty & Miller hydrogeologist.

Equipment used to sample unconsolidated sediments (e.g., continuous tube samplers, split-spoon samplers, stainless-steel spatulas, stainless steel pan and stainless steel coring device) will be decontaminated prior to collecting each sample. Disposable gloves will be worn while equipment is cleaned to avoid contamination, and the gloves will be changed frequently. The procedure for cleaning this equipment is as follows:

1. Prepare a 2-percent solution of Micro™ (low phosphate detergent) and distilled water in a bucket.

2. Disassemble the sampling device and coring device and immerse all parts along with the spatula and pan in the Micro™ solution.

3. Scrub all equipment in the bucket with a brush to remove any adhering particles.

4. Thoroughly rinse all equipment with tap water.

5. Rinse with deionized demonstrated analyte-free water.

6. Place clean equipment on a clean polyethylene sheet and allow to air dry.

7. Once dry, reassemble the cleaned core sampler.

8. Transfer the sampler to the driller (or helper) making sure that the individual is wearing clean, disposable gloves.

9. Equipment not used right after decontamination will be wrapped in aluminum foil until use.

3.7 QUALITY CONTROL

Quality-control samples will be used to monitor sampling and laboratory performance. The types of QC samples that will be included in the investigation are matrix spike/matrix spike duplicates (MS/MSD) and equipment blanks.

To ensure unbiased handling and analysis by the laboratory, the identity of quality-control samples will be disguised by means of coding so that the laboratory does not know which samples are included for quality-control purposes.

3.7.1 Duplicate Analyses

Sediment/fill samples will not be duplicated due to the non-homogeneous nature of the samples and the high degree of variability routinely seen with results from duplicate sediment/fill analysis.

3.7.2 Equipment Blanks

An equipment blank will be collected to assess the decontamination procedures used during sample collection. The sample is prepared by pouring distilled deionized water into the sampling device (which has been decontaminated and is ready for sampling) and then into the sampling container(s). One equipment blank will be incorporated into the sampling program for every ten samples of sediment/fill and will be analyzed for the same suite of constituents as the sediment/fill.

3.8 BOREHOLE COMPLETION

At each boring location, drilling and sampling will cease upon determination of the vertical extent of sediment/fill material. The drill cuttings will be mixed with bentonite and put back into the borehole. A stake or marker will be placed in the borehole to serve as a reference point for the actual drilling location, and its approximate location will be sketched onto a site map. The borehole's location and land surface elevation will be surveyed by an Illinois licensed land surveyor.

4.0 PHASE II FIELD WORK

Once the volume and chemical nature of the sediment/fill material has been determined, a small number of additional samples will be collected during a second phase of field work to determine if the material requires treatment prior to disposal. Geraghty & Miller anticipates that no more than five samples will be required to classify the material. Each of these samples will be analyzed for reactivity, corrosivity, ignitability, and the list of constituents which are analyzed by the TCLP (Table B-1). Sampling procedure for this phase will be the same as previously described in Section 3.3.

5.0 DATA VALIDATION

Geraghty & Miller will validate 10 percent of the samples collected according to the USEPA's 1990 "Data Reference Validation Functional Guidelines," and screen the remaining samples for completeness and technical compliance. The screening procedure requires much less time to complete. However, the laboratory will provide a CLP data package for all samples for possible future data validation, if required. The information to be screened for the remaining samples will include:

- Check to see if the field chain-of-custody form was filled out and if samples were properly logged.

- Review internal quality assurance/quality control (QA/QC) data. Confirm that blanks and spikes were analyzed on the minimum number of samples as specified in the QAPP.

- Review all equipment blank and MS/MSD data. If target compounds appear in blanks or if percent relative difference on duplicates is outside established limits, the reasons for these anomalies will be investigated. In such an event,

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sampling techniques will be discussed with the project manager and/or the laboratory manager and internal QA/QC data will be reviewed as appropriate.

- Check to see if holding times were met for each parameter.

- Check to see if parameters were analyzed by the methods identified in the QAPP.

- If data appears suspect, the specific data of concern will be investigated. Calculations will be traced back to the raw data. If the calculations did not agree with the prescribed limits, the cause will be determined and corrected, if possible.

ATTACHMENT A

Geraghty & Miller, Inc. Forms

GERAGHTY & MILLER, INC.
Ground-Water Consultants

SAMPLE/CORE LOG

Boring/Well ________ Project/No. ______________________________ Page ______ of ______

Site Location ______________________________ Drilling Started ____________ Drilling Completed ____________

Total Depth Drilled ____________ (feet)

Hole Diameter ______________ (inches) Type of Sample/ Coring Device ______________________________

Length and Diameter of Coring Device ______________________________ Sampling Interval ____________ feet

Drilling Fluid Used ______________________________ Drilling Method ______________

Drilling Contractor ______________________________ Driller ____________ Helper ____________

Prepared By ______________________________ Hammer Weight ________ Hammer Drop ______ inches

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description

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DAILY LOG

Well(s) ________ Project No ______________________________ Page ______ of ______

Site Location ______________________________

Prepared By ______________________________

Date/Time	Description of Activities

G&M Form 02 6 86

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Environmental Services

Laboratory Task Order No.

CHAIN-OF-CUSTODY RECORD

Page of

Project Number

Project Location

Laboratory

Sampler(s)/Affiliation

SAMPLE IDENTITY	Code	Date/Time Sampled	Lab ID	SAMPLE BOTTLE / CONTAINER DESCRIPTION									TOTAL

Sample Code: L = Liquid; S = Solid; A = Air

Total No. of Bottles/ Containers

Relinquished by: Received by:	Organization: Organization:	Date / /	Time	Seal Intact? Yes No N/A
Relinquished by: Received by:	Organization: Organization:	Date / /	Time	Seal Intact? Yes No N/A

Special Instructions/Remarks:

Delivery Method: [ ] In Person [ ] Common Carrier SPECIFY [ ] Lab Courier [ ] Other SPECIFY

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LOCATION SKETCH

Well(s) __________ Project/No. ______________________________ Page ______ of ______

Site Location ____

Observer ____

(Locate all wells, borings, etc. with reference to three permanent reference points; tape all distances; clearly label all wells, roads, and permanent features)

N

0 ft ft

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UTILITIES AND STRUCTURES CHECKLIST

Project: ______________________ **Prepared by:** ______________

Location: ______________________ **Date:** ______________

Instructions. This checklist has to be completed by a G&M staff member as a safety measure to insure that all underground utility lines, other underground structures as well as above-ground power lines are clearly marked out in the area selected for boring or excavation. **DRILLING OR EXCAVATION WORK MAY NOT PROCEED UNTIL LINES ARE MARKED AND THIS CHECKLIST HAS BEEN COMPLETED.** Arrangements for underground utility markouts are best made at the time of the preliminary site visit to allow client and/or utility company sufficient time. Keep completed checklist and maps onsite; send copy to Project Manager.

Assignment of Responsibility. Client is responsible for having underground utilities and structures located and marked. Preferably, the utilities themselves should mark out the lines.

Drilling or Excavation Sites. Attach a map of the property showing the proposed drilling or excavation site (or if sites are widely separated, several maps) clearly indicating the area(s) checked for underground utilities or underground structures and the location of above-ground power lines.

Utilities and Structures

Type	Not Present	Present	How Marked?[1]
Petroleum products line			
Natural gas line			
Steam line			
Water line			
Sewer line			
Storm drain			
Telephone cable			
Electric power line			
Product tank			
Septic tank/drain field			
Overhead power line			

1) Flags, paint on pavement, wooden stakes, etc.

Name and affiliation of person who marked out underground lines or structures.

______________ NAME ______________ ORGANIZATION ______________ PHONE

Emergency Procedures

Persons at site or facility to contact in case of emergency

1. ______________________ Phone ______________
2. ______________________ Phone ______________

Fire Dept.: Phone ______________ Ambulance: Phone ______________

Utility: Phone ______________ Utility: Phone ______________

Utility: Phone ______________ Utility: Phone ______________

Directions to nearest hospital (describe or attach map).

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Environmental Services

WATER SAMPLING LOG

Project/No. ______________________ Page ______ of ______

Site Location ______________________

Site/Well No ____________ Coded/ Replicate No. ____________ Date ____________

Weather ____________ Time Sampling Began ____________ Time Sampling Completed ____________

EVACUATION DATA

Description of Measuring Point (MP) ______________________

Height of MP Above/Below Land Surface ____________ MP Elevation ____________

Total Sounded Depth of Well Below MP ____________ Water-Level Elevation ____________

Held ________ Depth to Water Below MP ____________ Diameter of Casing ____________

Wet ________ Water Column in Well ____________ Gallons Pumped/Bailed Prior to Sampling ____________

Gallons per Foot ____________

Gallons in Well ____________ Sampling Pump Intake Setting (feet below land surface) ____________

Evacuation Method ______________________

SAMPLING DATA/FIELD PARAMETERS

Color ____________ Odor ____________ Appearance ____________ Temperature ________ °F/°C

Other (specific ion; OVA; HNU; etc.) ______________________

____

Specific Conductance, umhos/cm ____________ pH ____________

Sampling Method and Material ______________________

Constituents Sampled	Container Description From Lab ____ or G&M ____	Preservative

Remarks ______________________

Sampling Personnel ______________________

WELL CASING VOLUMES

GAL./FT				
	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

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G&M Form 12 6-86 Southform 89-1473

GERAGHTY & MILLER, INC

WATER LEVEL/PUMPING TEST RECORD

PAGE _____ OF _____

PROJECT ______________________ WELL __________ SITE ______________________

SCREEN SETTING __________ MEASURING POINT DESCRIPTION ______________ HEIGHT ABOVE GROUND SURFACE __________

STATIC WATER LEVEL __________ MEASURED WITH ______________ DATE/TIME __________

DRAWDOWN ☐ RECOVERY ☐ START OF TEST ______________ END OF TEST ______________ PUMPING WELL __________

DISTANCE FROM WELL MEASURED TO PUMPING WELL (r) __________ DISCHARGE RATE ______________ ORIFICE __________

DATE & TIME	WELL OR t (mins)	HELD (ft)	WET (ft)	DEPTH TO WATER (ft)	s (ft)	DEW.[1] CORR. (ft)	ART.[2] s' (ft)		Q (gpm)	MANO-METER (in)	REMARKS[3]
											MCA C156934

1) Dewatering Correction 2) Equivalent Artesian Drawdown 3) pH, Spec. Cond., Temp., Weather, Sand, Turbidity, etc.

G&M Form 10 6-86

GERAGHTY & MILLER, INC.
Environmental Services

TELEPHONE CONVERSATION RECORD

DATE: ______ TIME: ______ PROJECT: ______

FROM: ______ TO: ______

COMPANY: ______ COMPANY: ______

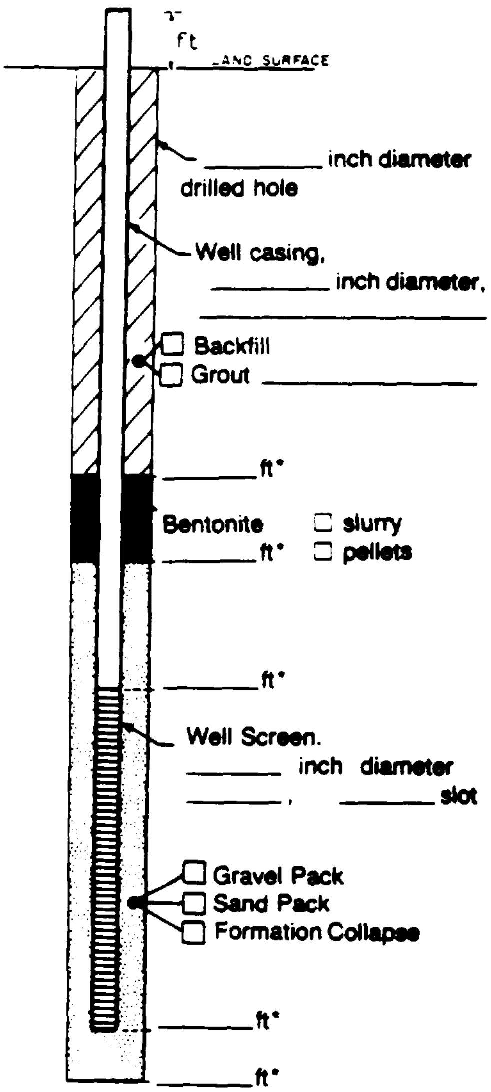
TELE NO: ______ TELE NO: ______

RE: ______

MCA 0156935

GERAGHTY & MILLER, INC.
Environmental Services

WELL CONSTRUCTION LOG
(UNCONSOLIDATED)



Measuring Point is
Top of Well Casing
Unless Otherwise Noted.

*Depth Below Land Surface

Project _______________ Well _______

Town/City _______________

County _______________ State _______

Permit No. _______________

Land-Surface Elevation

and Datum _______ feet ☐ Surveyed

_______________ ☐ Estimated

Installation Date(s) _______________

Drilling Method _______________

Drilling Contractor _______________

Drilling Fluid _______________

____

Development Technique(s) and Date(s)

____

____

____

Fluid Loss During Drilling _______________ gallons

Water Removed During Development _______________ gallons

Static Depth to Water _______________ feet below M.P.

Pumping Depth to Water _______________ feet below M.P.

Pumping Duration _______ hours

Yield _______ gpm Date _______

Specific Capacity _______ gpm/ft

Well Purpose _______________

____

____

Remarks _______________

____

____

____

____

____

Prepared by _______________

G&M Form 25 12 88

MCA 0156936

Southern 39-0979

GERAGHTY & MILLER, INC.
Ground-Water Consultants

DRILLING & INSTALLATION OF MONITORING WELLS DAILY CHECKLIST

PROJECT: ______________________ WELLS/BORINGS: ____________

LOCATION: ______________________ DATE: ____________

G&M PERSONNEL ON SITE: ______________________ TIME: ____________

CHECKED BY: ______________________

ITEMS	OK/NA	COMMENTS
PRIOR TO DRILLING:		
Contractor has checked for underground utilities		
Well locations staked		
Well drilling permits secured		
G&M QA Manual/QA plan available		
Health & Safety plan (HASP) available		
Safety equipment on site		
Contractor equipment adequate		
Drilling equipment steam cleaned		
Drilling water source approved/sampled		
Drilling equipment water sample taken		
Drilling mud & additives approved		
Sand or gravel pack sample approved		
Grout composition approved		
DURING INSTALLATION:		
Formation samples properly taken and bottled or bagged		
Rock color chart used		
OVA monitoring during drilling & sampling		
Cores properly marked and stored		
Hard hat worn		
Proper safety procedures followed		
Hazardous soil, mud or water properly handled*		
Daily Log kept		
Sample/Core Log form filled out		
Well Construction Log prepared		
Materials/Cost Log prepared		
Location Sketch made		
Tremie pipe used in grouting		
Abandoned well/boring grouted & staked		
Protective casing/well cap/lock installed		
Well identification no. attached		
Well development adequate		
Well elevation and location surveyed in		

*See QA Manual, Drilling and Installation of Monitoring Wells, Sect. 2.16.2.

MCA C156937

Instructions: Original to Field Project File; copy to Project Manager and to QA Representative.

JUNE 1986

GERAGHTY & MILLER, INC.
Ground-Water Consultants

SAMPLE CONTAINER INVENTORY

Project ______________________

Shipped from (laboratory) ______________________

Phone ______________________

Shipped to ______________________

Attn. ______________________

SHIPMENT CONTENTS

Shipped			Received	
Bottle Size and Composition	Preservative	Quantity	Quantity	Condition/Comments

Packed by ______________________
Date ______________________
Shipped by ______________________
Date ______________________
Sealing Method ______________________

Received by ______________________
Date ______________________
Inspected by ______________________
Date ______________________
Seal Intact? ______________________

Remarks:

MCA C156938

G&M Form 08 '87

Southpoint 87 '783

GERAGHTY & MILLER, INC.
Environmental Services

SAMPLING OF MONITORING WELLS
DAILY CHECKLIST

PROJECT ______________________ WELL(S) ______________

LOCATION ______________________ DATE ______________

G&M PERSONNEL ON SITE ______________________ TIME ______________

CHECKED BY ______________________

ITEMS	OK/NA	COMMENTS
PRIOR TO SAMPLING: Health & safety precautions (HASP) received: equipment ready.		
Sample containers, coolers, received from laboratory; ice or ice packs ready		
Sampling equipment and supplies inventoried, clean and operational.		
Check in with client at site.		
Integrity of well noted		
Well area prepared for sampling; plastic placed around well; gasoline-powered pumps placed downwind.		
Well and water-level measurements made and recorded along with other pertinent field information on water sampling log.		
Field instruments calibrated.		
Sample containers labelled; preservatives added, if necessary.		
DURING AND AFTER SAMPLING: Well purged three to five times its volume.		
Sample collected using a bailer or pump as per sampling plan.		
Measurement of field parameters recorded on sampling log.		
Sample containers filled according to collection protocol of analyses.		
Field and trip blanks collected; replicates or split samples collected as per sampling plan.		
Samples stored at 4°C in coolers for transport to lab.		
Water sampling log and chain-of-custody form completed.		
Reusable equipment decontaminated; non-reusable equipment disposed of in appropriate manner.		
Well secured and locked.		
Laboratory contacted to confirm receipt and condition of samples.		

Additional Comments:

MCA C156939

Instructions: Original to Field Project File; copy to Project Manager and to QA Representative.

G&M Form 13 11.90 Southorn 90-2349

GERAGHTY & MILLER, INC.
Ground Water Consultants

MATERIALS/COST LOG

Wells: ______________________ Project/No.: ______________________
Site Location: ______________________ Calculated By: ______________________ Checked By: __________

Well	Footage Drilled (ft)	Split Spoons (ea)	Screen Diam/Length (ft)	Casing Diam/Length (ft)	Sand or Gravel (bag)	Bentonite Pellets (lb)	Bentonite Powder (bag)	Cement (bag)	Devel-oping Time (hrs)	Rig time (hrs)	Other Items*
Totals											
Unit Cost	$	$	$	$	$	$	$	$	$	$	$
Cost Totals	$	$	$	$	$	$	$	$	$	$	$

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1/86

APPENDIX B

MCA C156941

[redacted]

EPA/CEPRO COPPER/EIL/PCB ATTORNEY WORK PRODUCT / ATTORNEY CLIENT PRIVILEGE

APPENDIX B

TITLE AND SIGNATURE PAGE

QUALITY ASSURANCE PROJECT PLAN
FOR THE SITE INVESTIGATION
FOR DEAD CREEK SECTOR B, AND
SITES L AND M,
SAUGET - CAHOKIA, ILLINOIS

Prepared by Geraghty & Miller, Inc. Date:________

Approved:________________________ Date:________
Monsanto Coordinator

Approved:________________________ Date:________
Geraghty & Miller, Inc. Project Officer

Approved:________________________ Date:________
Geraghty & Miller, Inc. Project Manager

Approved:________________________ Date:________
Geraghty & Miller, Inc. Quality Assurance Officer

Approved:________________________ Date:________
IEPA Quality Officer

DRAFT

MCA 0156942

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CONTENTS

TABLES

DRAFT

APPENDIX B

**QUALITY ASSURANCE PROJECT PLAN
FOR THE SITE INVESTIGATION
FOR DEAD CREEK SECTOR B,
AND SITES L AND M,
SAUGET - CAHOKIA, ILLINOIS**

INTRODUCTION

At the request of Monsanto Company, Geraghty & Miller, Inc. has prepared this Quality Assurance Project Plan (QAPP) for the Site Investigation to be carried out at Dead Creek Sector B, and Sites L and M in Sauget - Cahokia, Illinois (Figure 1). The overall objective of the investigation is to characterize the sites by determining the nature and extent of sediment/fill materials in the unsaturated zone in Sector B and Site L, and below the ponded water at Site M.

The United States Environmental Protection Agency (USEPA) requires that all environmental monitoring and measurement efforts mandated or supported by USEPA participate in a centrally managed quality assurance (QA) program. Under this program, Geraghty & Miller has the responsibility to implement minimum procedures to assure that the precision, accuracy, completeness, and representativeness of its data are known and documented. To ensure the responsibility is met uniformly, Geraghty & Miller has prepared a written QAPP.

This QAPP presents the organization, objectives, functional activities, and specific QA and quality control (QC) activities associated with the Site Investigation. This QAPP also describes the specific protocols which will be followed for sampling, sample handling and storage, chain of custody, and laboratory analysis.

All QA/QC procedures will be in accordance with applicable professional technical standards, USEPA requirements, government regulations and guidelines, and specific project goals and requirements. This QAPP is prepared by Geraghty & Miller in accordance with all USEPA QAPP guidance documents entitled "Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans (QAMS-005/80)," and the "Region V Model Superfund Quality Assurance Project Plan QAPjP (1991)."

1.0 PROJECT DESCRIPTION

1.1 SITE HISTORY/BACKGROUND INFORMATION

Dead Creek - Sector B

Dead Creek Sector B is located between Queeny Avenue and Judith Lane (Figure 2). The culverts at both ends for Sector B have been sealed to prevent inflow or outflow from this area. The banks of the creek are heavily vegetated and debris is visible in the area. The site is enclosed within a chain-link fence without a gate. In general, the creek area consists of a narrow channel about 5 feet wide which is flanked by low banks. The channel and banks are enclosed by steeper banks on either side of the creek. Precipitation that collects in the creek recharges the ground water below.

In 1980, the IEPA conducted a study at Dead Creek which included the installation of monitoring wells and borings, and the collection of surface-water, ground-water, and soil samples. A vertical profile of the creek sediments in the northern portion of Sector B and soil samples collected at 17 other locations indicate the presence of metals, PCBs, and other organic compounds.

In 1986, Ecology & Environment, Inc. (E&E) conducted a Remedial Investigation (RI) for the IEPA at several sites in Sauget, including Sector B, Sites L and M (Figure 2). In Sector B, E&E collected two surface-water samples and five sediment samples; however, the sampling locations were restricted to the north and south ends of the study area. The data from these sampling points indicate that past uses of the creek have impacted the site. Constituents detected included metals and PCBs.

Site L

Site L is located on the east side of Dead Creek, approximately 700 feet south of Queeny Avenue (Figure 2). It is the former location of a surface impoundment used by a hazardous waste hauler who disposed of wash water from truck cleaning operations. Site L was determined by E&E to be about 125 feet east of Dead Creek and encompasses an area approximately 145 feet by 195 feet. Currently, the site is covered with black cinders and is used for equipment storage by Metro Construction Equipment Company. Waste material is not visible at the surface and access to the site is not controlled. Surficial soil was not sampled by E&E.

In 1980, the IEPA installed a well downgradient of this area; however, due to its faulty construction, it was replaced by E&E in 1987.

In 1986, E&E drilled three soil borings, replaced the IEPA monitoring well, and conducted a soil-gas survey at Site L. The data from these sampling points indicates that past activities have impacted soil and ground water at the site. Compounds detected include benzene, toluene, phenols and arsenic. PCBs were not detected.

Site M

Site M is a former sand and gravel pit excavated between 1945 and 1950. The pit is approximately 335 feet by 235 feet and is filled with water. E&E estimated the pit's depth to be 40 feet. Site M is connected to Dead Creek Sector B at the southwest corner of Site M (Figure 2). It is not known whether Site M was excavated into the water table, although water is present in the pit year round. Other than miscellaneous trash, no other waste disposal was evident in the pit at the time of the E&E study. Access to the site is controlled by a chain-link fence.

In 1986, E&E collected two surface-water samples, five sediment samples, and soil-gas samples from the perimeter of Site M. Neither the surface-water samples nor the soil-gas samples indicated the presence of contamination. The PCB data from the sediment samples indicate that past site activities may have impacted the site. In 1980, the IEPA collected two, unfiltered, surface-water samples and PCBs were detected at 4.4 ppm and 0.9 ppm.

1.2 PROJECT OBJECTIVES AND SCOPE

The Site Investigation will be performed to obtain representative environmental data necessary for determining the conditions at the three sites. These data will be used to classify the material and assess the feasibility of removal. It will also be necessary to determine whether the sediment/fill is hazardous, and whether treatment will be required prior to disposal. The details of the investigation such as the selection of drilling locations, and sample collection activities are described below. A summary of sample matrices and parameters can be found in Table B-1.

The existing data available for Dead Creek Sector B are not sufficient to determine the extent of the sediment/fill, nor will it satisfy the requirements for a characteristic waste determination. Therefore, Geraghty & Miller will collect samples of sediment/fill across ten profiles, spaced approximately 200 feet apart, within the creek bed throughout the 2,000-foot length of Sector B. Three borings will be drilled along each profile, as shown on Figure 3. All borings will be drilled to determine the thickness of the sediment/fill in the creek and will be spaced about 15 to 20 feet apart. It is anticipated that the borings within the creek bed will be drilled to a maximum depth of about 7 feet. Samples will be collected using a 5-foot continuous tube sampler, with 3-inch diameter split spoons used if recovery is poor in the fine sandy sediments. Both methods will provide a continuous record of geology, as well as a sufficient volume of material for analysis. All samples will be described by a Geraghty & Miller field geologist who will record sample location, depth, grain size distribution, and color. Each sample will also be screened in the field for the presence of volatile organic compounds (VOCs) using a photoionization detection (PID) instrument.

Geraghty & Miller will select one sediment/fill sample per borehole for chemical analysis based on appearance and PID measurements. Each sample will be selected from a 2-foot interval that best characterizes sediment/fill in the creek. One sediment/fill sample per profile will be analyzed for USEPA Target Compound List/Target Analyte List (TCL/TAL) parameters, and the other two samples from each profile will be analyzed for TAL metals and PCBs. Appropriate QA/QC samples will also be collected as discussed in Section 3.1 (Level of Quality Control Effort). The analytical data from the sediment/fill will be used to delineate any impacted areas, as well as provide an estimate of the volume of sediment/fill that may require remediation. Each borehole will be sealed with a mixture of drill cuttings and bentonite grout. The borehole's location and land surface elevation will be surveyed by an Illinois licensed land surveyor. All drilling equipment will be steam cleaned after each borehole, and all sampling equipment will be decontaminated with a laboratory-grade detergent and potable water before the collection of each sample.

An all-terrain (ATV) drill rig will be used for the entire program. In some areas it may be necessary to pump off standing water (if present) to provide suitable sampling conditions. Alternatively, if a direct discharge is not possible, the boring program will be completed up to the area where the standing water is located, then the water may be pumped into the area of the creek where the boring program was completed. If there is too much water to transfer, portable equipment may be used, such as a tripod. In addition, a gate(s) will be installed within Sector B's chain-link perimeter fence to provide access for the drill rig and field crew.

To define the lateral and vertical extent of the fill material in Site L, six borings will be required to supplement the existing borings installed during the E&E investigation

(Figure 4). Previous soil sampling programs conducted by E&E in 1986 consisted of composite sampling over zones of inconsistent thickness, including both saturated and unsaturated soil in the same composite sample. The existing data are not sufficient to determine the extent of the fill material in this area.

At each boring location, Geraghty & Miller will collect continuous samples using a 5-foot tube sampler or a 3-inch diameter split-spoon, to delineate the bottom of the fill. The sample from each borehole that best characterizes the fill material will be submitted for laboratory analysis. Each sample will be obtained from a 2-foot section of the continuous core with the interval selected for analysis based on appearance and PID readings. At two of the six borings, the samples will be analyzed for TCL/TAL parameters. Based on existing data, PCBs, TAL metals, and VOCs have been selected for analysis at the remaining four borings, to determine the chemical nature of the fill material. Each borehole will be sealed and surveyed as described for Dead Creek Sector B.

The existing data for Site M are not sufficient to determine the extent of the impacted sediment, nor will it satisfy the requirements for a characteristic waste determination. Therefore, Geraghty & Miller will collect sediment samples from three locations beneath the ponded water (Figure 5). Steel casing will be driven into the sediments underlying the pond. A split-spoon sampler will be driven into the pond sediments and underlying sand and gravel to determine the thickness of the sediments. One sample for laboratory analysis of sediment will be selected from the 0 to 2-foot interval at each of the three locations. At one location, the sample will be analyzed for TCL/TAL parameters. At the other two locations, each sample will be analyzed for PCBs and TAL metals. Sample selection protocols and decontamination procedures will be the same as those described for Dead Creek Sector B.

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1.2.1 Phase II Field Work

Once the chemical nature of the sediment/fill material has been determined, several additional samples will be collected for hazardous characteristics. An estimated five samples will be required to classify the material. Each of these samples will be analyzed for reactivity, corrosivity, ignitability, and the list of toxicity characteristic leaching procedure (TCLP) constituents (Table B-2). The results of these analyses will be used to determine whether the sediment/fill material is a hazardous waste and whether it needs treatment prior to disposal.

1.3 DATA COLLECTION ACTIVITIES

Data collection activities are discussed in detail in the Work Plan and the Field Sampling Plan (FSP) in Appendix A.

1.3.1 Sample Network Design and Rationale

The sample network design and rationale for sample locations is described in detail in Sections 3.1, 3.2, and 3.3 of the Work Plan.

1.3.2 Sample Matrices/Parameters

A list of sediment/fill sample matrices/parameters is found in Table B-1. This table describes the matrices, analytical parameters, total number of samples to be collected, equipment blanks, and the total number of matrix spike and matrix spike duplicate samples. Information concerning sediment/fill sampling protocols are provided in the FSP in Appendix A.

1.4 DATA QUALITY OBJECTIVES

Data Quality Objectives (DQOs) are qualitative and quantitative statements which specify the quality of the data required to support decisions made during the project and are based on the end uses of the data to be collected. As such, different data uses may require different levels of data quality. There are five analytical levels which address various data uses and the QA/QC effort and methods are required to achieve the desired level of quality. These levels are:

- Screening (DQO Level 1): This level provides the lowest data quality but the most rapid results. It is often used for health and safety monitoring at the site, preliminary comparison to applicable or relevant and appropriate requirements (ARARs), initial site characterization to locate areas for subsequent and more accurate analyses, and for engineering screening of alternatives (bench-scale tests).

- Field Analyses (DQO Level 2): This level provides rapid results and better quality than in Level 1. This level may include mobile lab generated data depending on the level of quality control exercised.

- Engineering (DQO Level 3): This level provides an intermediate level of data quality and is used for site characterization. Engineering analyses may include mobile lab generated data and some analytical lab methods (e.g., laboratory data with quick turnaround used for screening but without full quality control documentation.

- Confirmational (DQO Level 4): This level provides the highest level of data quality and is used for purposes of risk assessment, evaluation of remedial alternatives and PRP determination. These analyses require full CLP analytical and data validation procedures in accordance with USEPA recognized protocol.

- Non-Standard (DQO Level 5): This level refers to analyses by non-standard protocols, for example, when exacting detection limits or when analysis of an unusual chemical compound is required. These analyses often require method development or adaptation. The level of quality control is usually similar to DQO Level 4 data.

The USEPA has developed a standard series of analytical support levels to demote types of analyses and the associated level of quality control effort.

Level 1 -	Field screening or analysis using portable instrumentation.
Level 2 -	Field analysis using more sophisticated instruments.
Level 3 -	Non-CLP laboratory methods.
Level 4 -	CLP routine analytical services methods.
Level 5 -	CLP non-standard services analytical methods.

The analytical support levels which will be used to generate the project data fall within (Levels 1, 3 and 4). A PID instrument will be used to screen samples (Level 1). Several samples will be analyzed for non-CLP parameters (Level 3) and TCL/TAL parameters by the Routine Analytical Services (RAS) methodology in the CLP Statement of Work (SOW) for Organic Analysis (2/88) and CLP SOW for Inorganic Analysis (ILM01.0) (Level 4). The non-CLP parameters and CLP parameters are listed in Table B-2 and B-3, respectively.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

Geraghty & Miller will be responsible for the overall management of the project, including the field inspection of all drilling, sampling activities, and the evaluation of remedial alternatives, if required. Responsibilities of key project personnel are explained in Section 4.0 of the work plan. Personnel from Monsanto will be actively involved in the investigation, and will coordinate with personnel from Geraghty & Miller.

2.1 PROJECT ORGANIZATION

The project organizational chart is shown on Figure 6. The following sections contain the definitions of responsibilities of the key project personnel.

Primary responsibility for project management is shared between the Geraghty & Miller Project Officer and the Project Manager. They will be responsible for providing technical assistance for all activities which are directly related to the determination of the geologic conditions and the environmental quality of the site.

Responsibility for all quality assurance/quality control review lies with the QA/QC Advisor. Data processing will be overseen and reviewed by the Field Hydrogeologist and QA/QC Advisor. A stringent review of the data, including 10 percent fully validated, will be performed by the Data Validator. The review of all data will be conducted by the Project Officer and Project Manager. If quality assurance problems or deficiencies requiring special action are identified, the Project Officer, Project Manager, and Project QA/QC Advisor will determine the appropriate corrective action.

2.2 FIELD ORGANIZATION

The Geraghty & Miller field team will be organized according to the planned activity. For this off-site investigation, the field crew will consist of the Field Hydrogeologist and the drilling subcontractor.

The Field Hydrogeologist will be responsible for the coordination of all personnel on site, and for providing technical assistance when required. The Field Hydrogeologist, or his/her designee, will be present during all sampling activities. He/she will keep a general site log describing activities conducted on site, which will include the identification of personnel entering the site, and the recording of general observations regarding site activities. The Field Hydrogeologist will be responsible for providing technical supervision of the drilling subcontractor. In addition, he/she will be responsible for the geologic logging performed during the soil boring program.

The Field Hydrogeologist will also be responsible for coordination of all sampling efforts and will assure the availability and maintenance of the necessary shipping and packing materials, and sampling equipment. The Field Hydrogeologist will (1) supervise the completion of all sampling documentation, (2) ensure the proper handling and shipping of all the samples, and (3) be responsible for the accurate completion of the field notebook. The Field Hydrogeologist will also assume custody of all samples and will be responsible for (1) the completion of all chain-of-custody forms, (2) maintaining communication with on-site personnel, (3) logging all communications, and (4) site entries and departures during sampling.

The Field Hydrogeologist, in conjunction with the QA/QC Advisor, will be responsible for the adherence of all QA/QC guidelines as defined in this QAPP. Strict adherence to these procedures is critical to the collection of acceptable and representative data.

The Data Validator is responsible for review of laboratory data for compliance with the precision, accuracy, representativeness, comparability, and completeness (the "PARCC" parameters), and notifications to the Project Manager of any QC deficiencies.

The project Health and Safety Manager will be responsible for assuring that all field crew adhere to the site health and safety requirements. Additional responsibilities of the project Health and Safety Manager are as follows:

- Updating equipment or procedures based upon new information gathered during the site operation.

- Modifying the levels of protection based upon information from the Field Hydrogeologist.

- Determining and supplying locations and routes to medical facilities, including poison control centers, and arranging for emergency transportation to medical facilities.

- Notifying local public emergency officers, including police and fire departments, of the nature of the team's operation and for supplying these department's telephone numbers.

- Examining work-party members for symptoms of exposure or stress.

- Providing emergency medical care and first aid as necessary on site. The Field Hydrogeologist also has the responsibility to stop any field operation that threatens the health or safety of the team or the surrounding populace.

Tasks which will be performed by subcontractors include drilling, surveying, and analytical (laboratory) testing. Subcontractor managers have overall responsibility for the performance of their tasks in accordance with the project plans and specifications, interaction with the project manager, and adherence to the project schedule.

2.3 LABORATORY OPERATIONS

Laboratory chemical analyses of all sediment/fill samples will be performed by Savannah Labs, Inc. of Savannah, Georgia. An analytical QAPP is on file with the laboratory.

3.0 QUALITY ASSURANCE OBJECTIVES

The overall QA objective is to develop and implement procedures for field sampling, chain-of-custody, laboratory analysis, and reporting that will provide environmental monitoring data of known and acceptable quality. Specific procedures to be used for sampling, chain-of-custody, calibration of field instruments, laboratory analysis, reporting, internal quality control, audits, preventative maintenance, and corrective actions are described in later sections of this QAPP. The purpose of this section is to address the data quality objectives in terms of accuracy, precision, quantitation limits, representativeness, comparability, and completeness.

3.1 LEVEL OF QUALITY CONTROL EFFORT

Equipment blanks and matrix spike samples will be analyzed to assess the quality of the data resulting from the field sampling program. Equipment blanks consisting of distilled water will be submitted to the analytical laboratories to provide the means to assess the quality of the data resulting from the field sampling program. Equipment blank samples are analyzed to check for procedural contamination at the site, which may cause sample contamination. Matrix spikes provide information about the effect of the sample matrix on the digestion and measurement methodology. All matrix spikes are performed in duplicate and are hereinafter referred to as MS/MSD samples. One matrix spike/matrix spike duplicate will be collected for every 20 or fewer investigative samples. The general level of the QC effort will be one equipment blank for every 10 or fewer investigative samples.

MS/MSD samples are investigative samples. Soil MS/MSD samples require no extra volume for VOCs or extractable organics. One MS/MSD sample will be collected/designated for every 20 or fewer investigative samples per sample matrix (i.e., sediment/fill). The number of MS/MSD samples and equipment blank samples to be collected are listed in Table B-1. Sampling procedures are specified in the FSP (Appendix A).

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The level of QC effort provided by the laboratory will be equivalent to the level of QC effort specified under the CLP program for the RAS. The level of QC effort for testing TAL inorganics (metals and cyanide) will conform to the protocols of the CLP SOW for inorganics (ILM01.0). The level of QC effort for testing of TCL organics (volatiles, semivolatiles, and pesticides/PCBs) will conform to the protocols of the CLP SOW for organics (2/88). The quantitation levels for the TCL/TAL parameters are listed in Table B-3.

The level of QC effort for testing of TCLP parameters in soil samples will conform to protocols in USEPA SW-846. The quantitation levels for the TCLP parameters are listed in Table B-2.

3.2 ACCURACY

Accuracy is the relationship of the reported data to the "true" value. The accuracy of the methods used for sediment/fill samples will be determined from the analysis of MS/MSDs and surrogate spikes. MS/MSDs will be analyzed at a rate of one per every 20 or fewer samples. Surrogate spikes are added to each sample, MS/MSD, blank and standard. The compounds used and their accuracy limits are set by the CLP SOWs. Outside evaluation standards such as USEPA reference check standards and Performance Evaluation samples are also periodically analyzed by the laboratory to determine accuracy.

Additional sample material will be provided for each MS/MSD analysis. These samples will be indicated on the appropriate chain-of-custody form. Accuracy for the analyses using methodology not specified in the CLP SOW will be assured through standard laboratory QA/QC methods.

3.3 PRECISION

Measurements of the data precision are necessary to demonstrate the reproducibility of the data. Precision for the TCL/TAL analyses will be determined from the analysis of MS/MSD samples as specified in the CLP SOWs. Precision of the analyses using methodology not specified in the CLP SOWs will be assured through standard laboratory QA/QC methods.

3.4 COMPLETENESS

Completeness is a measure of the amount of valid data obtained from the measurement program, compared to the total amount collected. The validity of the collected data will be evaluated with QA/QC guidelines. Explanation of the completeness measurement and percent completeness is described in the laboratory QAPP. The laboratory should provide data that meet QC acceptance criteria for 90 percent or more of the requested determinations. If the percent completion limits are not met, the laboratory may be required to re-analyze samples or re-sampling may be required.

3.5 REPRESENTATIVENESS

All data obtained should be representative of actual conditions at the sampling location. The sediment/fill sampling network was designed to provide data representative of site conditions. Considerations for evaluating the representativeness of the data include, but are not limited to the location being sampled, the methods used to obtain environmental samples at the site, and the appropriateness of the analytical method to the type of sample obtained. The rationale of the sampling network is described in detail in the Work Plan. All field activities will be performed according to the protocols discussed in detail in the FSP (Appendix A).

3.6 COMPARABILITY

Comparability expresses the confidence with which one data set can be compared with another. The extent to which existing and planned analytical data will be comparable depends on the similarity of sampling and analytical methods. The procedures used to obtain the planned and analytical data, as documented in the QAPP, are expected to provide comparable data. These new analytical data, however, may not be directly comparable to existing data because of difference in procedures and QA objectives.

3.7 QUANTITATION LIMITS

Quantitation limits for the TCL/TAL analyses are provided in the CLP SOWs, and are also listed in Table B-3 unless dilution or interference effects make it necessary to raise them. The laboratory will make every effort to achieve quantitation limits as low as practicable and will report estimate concentration values at less than the detection limit by flagging the value with a J.

4.0 SAMPLING PROCEDURES

Procedures to collect all samples at the site are described in the FSP (Appendix A). This plan includes information on sampling procedures, equipment decontamination, sample documentation, sample shipping, and chain-of-custody. Preservation, container, and holding-time requirements for the parameters to be analyzed are presented in Table B-4. Samples to be analyzed for the TCLP parameters will be prepared for analysis by the laboratory following USEPA SW-846 Method 1311.

5.0 SAMPLE CUSTODY

Sample custody procedures are designed to provide documentation of preparation, handling, storage, and shipment of all collected samples. An example of the chain-of-custody form is attached to Appendix A.

Samples collected during the site investigation will be the responsibility of identified persons from the time they are collected until they, or their derived data, are incorporated into the final report. Stringent chain-of-custody procedures will be followed to document sample possession.

5.1 FIELD CHAIN-OF-CUSTODY PROCEDURES

A sample is under custody if it is in your possession, or it is in your view after being in your possession, or it was in your possession and you locked it up, or it is in a designated secure area.

1. The Field Hydrogeologist is responsible for the care and custody of the samples collected until they are delivered to the analyzing laboratory or entrusted to a carrier. As few people as possible should handle the samples.

2. Geraghty & Miller Sample/Core logs will be used to document the data collection activities. All entries will be made in ink with no erasures. A single stroke will be used to cross out incorrect information; corrections will be dated and initialed. The Sample/Core log will be used to record a variety of information including date, start and end of time of activities, names of all sampling team members, weather conditions, sample location, equipment used to collect sample, depth of sample, time of collection, sample description, sample identification number, and the volume and number of containers.

3. Chain-of custody sample forms will be completed in the field to the fullest extent possible prior to sample shipment. They will include the following information: sample number, time collected, source of sample and location, depth from which sample was taken, preservative, and name of sampler. These forms will be filled out in a legible manner, using water-proof ink, and will be signed by the sampler. Similar information will be provided on the sample label which will be securely attached to the sample bottle. In addition, sampling forms will be used to document collection, filtration (if required), and preparation procedures.

4. The Project Manager will review all field activities to determine whether proper custody procedures were followed during the field work, and decide if additional samples are required.

5.2 TRANSFER OF CUSTODY AND SHIPMENT

The following procedures will be used when transferring custody of samples:

1. Samples will always be accompanied by a chain-of-custody record completed according to the protocols outlined in the previous sub-section. When transferring samples, the individuals relinquishing and receiving them will sign, indicate the date, and note the time on the record. This record documents the sample custody transfer from the sampler to the laboratory, often through another person or agency. Upon arrival at the laboratory, internal custody procedures will be followed, in accordance with the laboratory QAPP.

2. Samples will be packaged properly for shipment, and dispatched to the laboratory for analysis with individual custody records accompanying each shipment. Shipping containers will be sealed for shipment to the laboratory. The method of shipment, courier name, and other pertinent information, will be entered in the remarks section of the custody record.

3. All shipments will be accompanied by the chain-of-custody record identifying the contents. The original record will accompany the shipment; a copy will be retained by the field sampler.

4. Proper documentation will be maintained for shipments by common carrier.

5.3 SAMPLE SHIPMENT PROCEDURES

The following procedures will be followed when shipping samples for laboratory analysis:

1. Samples requiring refrigeration will be promptly chilled with ice or "Blue Ice" to a temperature of 4°C and packed in an insulated cooler for transport to the analyzing laboratory.

2. Only shipping containers which meet all applicable state and federal standards for safe shipment will be used.

3. To provide a means of detecting any potential tampering during shipment, all shipment containers (coolers) will be affixed with signed Geraghty & Miller sample seals. Two seals will be affixed to each cooler, on opposite ends. In addition, 2-inch wide transparent tape will be wrapped entirely around the cooler.

4. The field chain-of-custody document will be placed inside the shipping container in a sealed plastic envelope after the courier has signed the document.

5. Shipment will be made by overnight courier.

5.4 FIELD DOCUMENTATION RESPONSIBILITIES

Field daily log forms will provide the means of recording data collecting activities performed. Entries will be described in as much detail as possible so that persons going to the site can reconstruct a particular situation without reliance upon memory. It will be the responsibility of the Field Hydrogeologist to secure all documents produced in the field (i.e., geologist's daily logs, lithologic and sampling logs, communications, etc.) at the end of each work day.

The data generated by the laboratory will be sent to Geraghty & Miller, validated, and stored by Geraghty & Miller until completion and acceptance of the investigation report.

5.5 LABORATORY CHAIN-OF-CUSTODY PROCEDURES

The chain-of-custody procedures for the CLP laboratory are described in the SOW for RAS. The same custody procedure applies to the samples to be analyzed for TCLP parameters. These custody procedures along with the holding time requirements for samples to be analyzed for the TCL/TAL parameters are described in the CLP SOWs.

5.6 FINAL EVIDENCE FILES CUSTODY PROCEDURES

Geraghty & Miller is the custodian of the evidence file and maintains the contents of evidence files for the Site Investigation, including all relevant records, reports, logs, field notebooks, pictures, subcontractor reports, correspondence, laboratory logbooks, chain-of-

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custody form, and Laboratory Scientific Support Section (LSSS) of CLP's data reviews in a secured, limited access area and under custody of the project manager.

6.0 CALIBRATION PROCEDURES AND FREQUENCY

This section describes procedures for maintaining the accuracy of all the instruments and measuring equipment which are used for conducting field tests and laboratory analyses. These instruments and equipment should be calibrated prior to each use or on a scheduled, periodic basis.

6.1 FIELD INSTRUMENTS/EQUIPMENT

Instruments and equipment used to gather, generate, or measure environmental data will be calibrated with sufficient frequency and in such a manner that accuracy and reproducibility of results are consistent with the manufacturer's specifications.

Equipment to be used doing the field sampling will be examined to certify that it is in operating condition. This includes checking the manufacturer's operating manual and the instructions for each instrument to ensure that all maintenance requirements are being observed. Field notes from previous sampling trips will be reviewed so that the notations of any prior equipment problem are not overlooked, and all necessary repairs have been made.

Calibration of field instruments is governed by the specific Standard Operation Procedure (SOP) for the applicable field analysis method, and such procedures take precedence over the following general discussion.

Calibration of field instruments will be performed at the intervals specified by the manufacturer or more frequently as conditions dictate. A log book will be kept documenting calibration results for each field instrument. The log book will include the date, standards, personnel, and calibration results.

6.2 LABORATORY INSTRUMENTS

Calibration procedures and frequencies for laboratory equipment used in the analysis of environmental samples will be performed in accordance with those specified in the CLP SOWs and the laboratory QAPP.

7.0 ANALYTICAL PROCEDURES

All soil and sediment samples collected during field sampling activities for the Sauget Sites - Area 1 investigation will be analyzed by Savannah Laboratories, Inc.

7.1 LABORATORY ANALYSIS

All samples for TCL/TAL parameters will be analyzed according to analytical procedures set forth in the CLP SOW (2/88) for organics analysis and the CLP SOW (ILM01.0) for inorganic analysis. All samples for TCLP parameters will be analyzed according to the analytical procedures set forth in USEPA SW-846. Listed in Table B-4 are the sample container types, required preservation, analysis holding times, and sample preservatives for these parameters.

8.0 DATA REDUCTION, VALIDATION AND REPORTING

All data collected during the Site Investigation, including field and laboratory (chemical and geotechnical) results, will be reduced, validated (10 percent - see Section 8.2), summarized, and reported according to specifications outlined in the CLP SOW (2/88) for organic analysis and CLP SOW (ILM01.0) for inorganic analysis.

8.1 DATA REDUCTION

The reduction of the field data will consist of summarizing the raw field data. They will be presented in the form of tables, logs, illustrations, and graphs, as deemed appropriate by the Project Manager.

The analytical data from the laboratory will be reduced to appropriate forms as determined by the Project Manager. The original data and reduced form will be maintained at the Geraghty & Miller office until acceptance of final reports. The reduced data will be checked against original data to determine if transcription or calculation errors have occurred.

8.2 DATA VALIDATION

Data validation consists of a stringent review of an analytical chemical data package with respect to sample receipt and handling, analytical methods, data reporting and deliverables, and document control. The quality of data generated by a laboratory is extremely important; it is an integral part of the investigation and should be clearly tied to the project goals. Data used to develop qualitative trends, for example, will not have the same data validation requirements as data used for litigation purposes.

A qualified Geraghty & Miller chemist will validate 10 percent of the samples collected according to the procedures described in "Laboratory Data Validation Functional Guidelines for Evaluating Chemical Data" prepared for the Hazardous Site Evaluation Division of the USEPA (Inorganics - July 1988, Organics - February 1988).

The remaining samples collected will be screened for completeness and technical compliance. The screening procedure requires much less time to complete. However, the laboratory will provide a CLP data package for all samples for possible future data validation, if required. The information to be screened for the remaining samples will include:

- Check to see if the field chain-of-custody form was filled out and if samples were properly logged.
- Check to see if parameters were analyzed by the methods identified in the QAPP.
- Check to see if holding times were met for each parameter.
- Review internal quality assurance/quality control (QA/QC) data. Confirm that blanks and spikes were analyzed on the minimum number of samples as specified in the QAPP.
- Review all equipment blanks and MS/MSD data. If target compounds appear in blanks or if percent relative difference on duplicates is outside established limits, the reasons for these anomalies will be investigated. In such an event, sampling techniques will be discussed with the project manager and/or the laboratory manager and internal QA/QC data will be reviewed as appropriate.
- If data appears suspect, the specific data of concern will be investigated. Calculations will be traced back to the raw data. If the calculations did not agree with the prescribed limits, the cause will be determined and corrected, if possible.

After the data is reviewed and/or validated, a listing of nonconformities is generated and used to determine whether the data can be utilized for its intended purpose (assessment, enforcement, litigation, etc.). Non-conformities require data qualifiers, which are used to alert the data user to inaccurate or imprecise data. For example, if holding times are exceeded, the Data Validator must qualify all positive results as estimated and all sample quantitation limits as estimated. The reviewer may make professional judgments and/or comments on the validity of the overall data package for a sampling event. This is particularly appropriate for sampling events in which there are several quality control criteria out of specification with regard to the limits specified in "Laboratory Data Validation Functional Guidelines for Evaluating Chemical Data". In these cases, it may be required that the sample be re-analyzed.

The net result is data which has been carefully reviewed and 10 percent validated for its adherence to prescribed requirements and its suitability for its intended use.

8.3 DATA REPORTING

The analytical data, including quality control samples, will be reported in tabular form with identification of sample number, matrix, parameters, detection limits, and concentrations detected. The data tabulations will be sorted by classes of constituents (e.g., volatile compounds, semivolatile compounds).

The tables and logs will be compiled whenever feasible by the Field Hydrogeologist, who will inform the Project Manager of any problems encountered during data collection, identify apparent inconsistencies, and provide opinions on the data quality and limitations. The tables and logs will be used as the basis for data interpretation and will be checked against the original field documentation prior to use by an independent reviewer.

9.0 INTERNAL QUALITY CONTROL CHECKS

The Field Hydrogeologist will make use of the equipment blanks to ensure and document the integrity of sample collection, sample handling procedures and the validity of the measurement data. Sediment/fill samples will not be duplicated due to the non-homogeneous nature of the samples and the high degree of variability routinely seen with results from duplicate sediment/fill analysis. The frequencies for collecting the QC samples are specified in Section 3.1. The procedures for collecting the QC samples are specified in the FSP.

There are two types of quality assurance mechanisms used to ensure the production of analytical data of known and documented quality, analytical method QC, and program QA. The internal quality control procedures for the analytical services on environmental samples to be provided are specified in the CLP SOWs. These specifications include the types of control samples required (calibration standards, sample spikes, surrogate spikes, internal standards, controls, blanks), the frequency of each control, the compounds to be used for sample spikes and surrogate spikes, and the quality control acceptance criteria. It will be the laboratory's responsibility to document in each package that both initial and on-going instrument and analytical QC criteria are met. This documentation will be included in the packages generated by the selected laboratories.

The field-collected quality control sample results will also be compared to acceptance criteria, and documentation will be performed showing that criteria have been met. Any samples in non-conformance with the QC criteria will be identified and re-analyzed by the laboratory, if possible. The following procedures will be employed by the laboratory for the Site Investigation:

- Proper storage of samples.
- Use of qualified and/or certified technicians.
- Use of calibrated equipment traceable to National Bureau of Standards or USEPA standards.
- Formal independent confirmation of all computation and reduction of laboratory data and results.
- Use of standardized test procedures.

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10.0 PERFORMANCE AND SYSTEM AUDITS

System audits will be performed on a semi-continuous basis, as appropriate, to assure that the work is being implemented in accordance with the FSP and in an overall satisfactory manner.

- The Field Hydrogeologist will supervise and check on a daily basis that field measurements are made accurately, equipment is thoroughly decontaminated, samples are collected and handled properly, and that the field work is accurately and neatly documented. QC checklists will be filled out daily during sampling as described in the FSP (Appendix A).

- On a timely basis, the Data Validator will review the data packages submitted by the laboratory to check that the data has been obtained through the approved methodology with the appropriate level of QC effort and reporting, holding times were met, and that the results are in conformance with the QC criteria. On the basis of these factors, the Data Validator will evaluate the data quality and limitations.

- The Project Manager will oversee the Field Hydrogeologist and Data Validator, and check that management of the acquired data proceeds in an organized and expeditious manner.

- System audits for the laboratory are performed on a regular basis by USEPA, as well as by various state agencies. These audits are discussed in the laboratory QAPP.

Performance audits of laboratories participating in the CLP are performed quarterly in accordance with the procedures and frequencies established by USEPA for the CLP. The laboratory performance evaluation audits are discussed in the laboratory QAPP.

11.0 PREVENTATIVE MAINTENANCE

Geraghty & Miller has established a program for the maintenance of field equipment to ensure the availability of equipment in good working order when and where it is needed:

- The Equipment Manager keeps an inventory of the equipment in terms of items (model and serial number) quantity and condition. Each item of equipment is signed out when in use, and its operating condition and cleanliness checked upon return. The Equipment Manager conducts routine checks on the status of equipment, and is responsible for the stocking of spare parts and equipment readiness. The Equipment Manager maintains the equipment manual library and trains field personnel in the proper use and care of equipment.

- The Field Hydrogeologist is responsible for working with the Equipment Manager to make sure that the equipment is tested, cleaned, charged, and calibrated in accordance with the manufacturer's instructions before being taken to the job site.

The laboratory follows a well-defined program to prevent the failure of laboratory equipment and instrumentation. This preventative program is described in the laboratory QAPP.

12.0 DATA ASSESSMENT PROCEDURES

The field and laboratory generated data in the investigation will be assessed for its precision, accuracy representativeness, completeness and comparability. Both qualitative and quantitative procedures will be used for these assessments.

Field measurements will be assessed on the basis that the measurements were made properly using calibrated instruments. The assessment of the sampling data with respect to field performance will be based on the criteria that the samples were properly collected and handled. The field QC sample results will also be used in assessing the representativeness and comparability of the samples collected. The Project Manager will have the overall responsibility for assessment of the data and integrating the results of the assessment into data use and interpretation.

The laboratory will calculate and report in the data packages the precision, accuracy, completeness, and sensitivity of the analytical data. Precision will be expressed as the relative percent difference (RPD) between values for MS/MSD samples. Accuracy will be expressed as percent recoveries (%R) for surrogate standards and matrix spike compounds. The precision and accuracy results will be compared to the prescribed QC acceptance criteria. The QC acceptance criteria prescribed for each test method are presented in the laboratory QAPP. For the TCL/TAL parameters, these criteria conform to the control limits established in the CLP SOWs for Organic and Inorganics Analyses.

Completeness is expressed as the percentage of valid data, based on the total amount of data intended to be collected. The laboratory will make every attempt to generate completely valid data.

The assessment of data representativeness with respect to laboratory performance will be based on the criteria that the samples were properly handled and analyzed within the holding times and the method blank results. Data comparability will be assessed based on the criteria that analyses were performed in strict adherence with the CLP and other standard USEPA analytical protocols.

The achievement of method detection limits depend on instrument sensitivity and matrix effects. Therefore, it is important to monitor the instrumental sensitivity to ensure the data quality through constant instrument performance. The instrumental sensitivity will be monitored through the analysis of method blanks, calibration check samples, and laboratory control samples.

13.0 CORRECTIVE ACTIONS

Corrective actions may be required for analytical and equipment problems and noncompliance problems. Analytical and equipment problems may occur during sampling and sample handling, sample preparation, laboratory instrumental analysis, and data review.

For noncompliance problems, a formal corrective action program will be determined and implemented at the time the problem is identified. The person who identifies the problem is responsible for notifying the Project Manager. If the problem is analytical in nature, information on these problems will be promptly communicated to the USEPA Quality Assurance Section. Implementation of corrective action will be confirmed in writing through these same channels.

Any nonconformance with the established quality control procedures in the QAPP or FSP will be identified and corrected in accordance with the QAPP. If warranted, the Project Manager, or his designee, will issue a written statement for each nonconformance condition.

Corrective actions will be implemented and documented in the field log. No staff member will initiate corrective action without going through the proper channels. Additional work which is dependent upon an unacceptable activity will not be performed until the problem has been eliminated.

The laboratory maintains a corrective action system which is described in the laboratory QAPP.

14.0 QUALITY ASSURANCE REPORTS

The QA/QC Advisor will review all aspects of the implementation of the QAPP on a regular basis and prepare a summary report. Reviews will be performed at the completion of each field activity and reports will be completed at this time. These reports will include an assessment of data quality; the results of system and/or performance audits; changes in QA project plan; summary of QA/QC programs, training and accomplishments; significant QA/QC problems, recommended solutions, and results of corrective actions; and limitations on use of the measurement data. Any significant QA deficiencies will be reported and identified, and corrective action possibilities discussed.

The final report will contain QA sections summarizing data quality information collected during the project.

Table B-1 Summary of Sampling Activity and Parameters for Sector B, and Sites L and M, Sauget - Cahokia, Illinois.

Site	Sample Matrix	Parameters	Total Number of Samples	MS/MSD	Aqueous Equipment Blanks
Dead Creek Sector B	Sediment/Fill	TCL VOCs, TCL SVOCs, TCL Pest/PCBs, TAL Metals	10	1	1
		TAL Metals, TCL PCBs	20	1	2
Site L	Sediment/Fill	TCL VOCs, TCL SVOCs, TCL Pest/PCBs, TAL Metals	2	1	1
		TAL Metals, TCL Vocs, TCL SVOCs	4	–	–
Site M	Sediment/Fill	TCL VOCs, TCL SVOCs, TCL Pest/PCBs, TAL Metals	1	1	1
		TAL Metals, TCL PCBs	2	–	–
Phase II (All Sites)	Sediment/Fill	TCLP, Reactivity, Corrosivity, Ignitability	To Be Determined	1	–

TCL Target compound list.
TAL Target analyte list.
VOCs Volatile organic compounds.
SVOCs Semivolatile organic compounds.
Pest/PCBs Pesticides/PCB Compounds.
TCLP Toxicity characteristic leaching procedure.

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Table B-2. RCRA Hazardous Characteristic Parameters to be Analyzed for Sector B, and Sites L and M, Sauget - Cahokia, Illinois.

Parameter	Method Reference Number	Quantitation Limit	Regulatory Limit
Ignitability	1010 M (a)	-	-
Corrosivity	9045	-	-
Reactivity	9010/9030 (b)	1.0/2.5 mg/kg	-
TOXICITY CHARACTERISTIC LEACHING PROCEDURE			
Volatiles	8240		
Benzene		0.020 mg/L	0.5 mg/L
Carbon Tetrachloride		0.020 mg/L	0.5 mg/L
Chlorobenzene		0.020 mg/L	100 mg/L
Chloroform		0.020 mg/L	6 mg/L
2-Butanone		0.040 mg/L	200 mg/L
Tetrachloroethlene		0.020 mg/L	0.7 mg/L
Trichloroethlene		0.020 mg/L	0.5 mg/L
Vinyl chloride		0.040 mg/L	0.2 mg/L
1,2-Dichloroethane		0.020 mg/L	0.5 mg/L
1,1-Dichloroethene		0.020 mg/L	0.7 mg/L
Semi-Volatiles	8270		
1,4-Dichlorobenzene		0.050 mg/L	7.5 mg/L
Hexachloroethane		0.050 mg/L	3 mg/L
Nitrobenzene		0.050 mg/L	2 mg/L
Hexachlorobutadiene		0.050 mg/L	0.5 mg/L
2,4,6-Trichlorophenol		0.050 mg/L	2 mg/L
2,4,5-Trichlorophenol		0.25 mg/L	400 mg/L
2,4-Dinitrotoluene		0.050 mg/L	0.13 mg/L
Hexachlorobenzene		0.050 mg/L	0.13 mg/L
Pentachlorophenol		0.25 mg/L	100 mg/L
2-Methylphenol		0.050 mg/L	200 mg/L
3 & 4-Methylphenol*		0.050 mg/L	200 mg/L
Pyridine		0.25 mg/L	5 mg/L
* Cannot be separated			
Pesticides	8080		
Chlorodane		0.0050 mg/L	0.03 mg/L
Endrin		0.0010 mg/L	0.02 mg/L
Heptachlor		0.00050 mg/L	0.008 mg/L
Heptachlor Epoxide		0.00050 mg/L	0.008 mg/L
Lindane		0.00050 mg/L	0.4 mg/L
Methoxychlor		0.025 mg/L	10 mg/L
Toxaphene		0.050 mg/L	0.5 mg/L

(a) 1010 M Modified by the laboratory for solid samples.
(b) 7010 Reactivity for Cyanide. Quantitation limit is 0.100 milligrams per kilogram (mg/kg).
9050 Reactivity for Sulfide. Quantitation limit is 10 mg/kg.
mg/L Micrograms per liter.
mg/kg Micrograms per kilogram.
RCRA Resource Conservatives and Recovery Act.

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Table B-2. RCRA Hazardous Characteristic Parameters to be Analyzed for Sector B, and Sites L and M, Sauget - Cahokia, Illinois.

Parameter	Method Reference Number	Quantitation Limit	Regulatory Limit
TOXICITY CHARACTERISTIC LEACHING PROCEDURE			
Herbicides			
2,4-D	8150	0.050 mg/L	10 mg/L
Silvex		0.010 mg/L	1 mg/L
Metals	6010 7410		
Arsenic		0.20 mg/L	5 mg/L
Barium		1.0 mg/L	100 mg/L
Cadmium		0.010 mg/L	1 mg/L
Chromium		0.050 mg/L	5 mg/L
Lead		0.20 mg/L	5 mg/L
Mercury		0.020 mg/L	0.2 mg/L
Selenium		0.[illegible]0 mg/L	1 mg/L
Silver		0.010 mg/L	5 mg/L

(a) 1010 M Modified by the laboratory for solid samples.
(b) 7010 Reactivity for Cyanide. Quantitation limit is 0.100 milligrams per kilogram (mg/kg).
9050 Reactivity for Sulfide. Quantitation limit is 10 mg/kg.
mg/L Micrograms per liter.
mg/kg Micrograms per kilogram.
RCRA Resource Conservatives and Recovery Act.

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Table B-3. Target Compound List/Target Analyte List Parameters to be Analyzed for Sector B, and Sites L and M, Sauget - Cahokia, Illinois.

Parameter	CAS Number	Estimated Quantitation Limit* Water** (ug/L)	Estimated Quantitation Limit* Soil** (ug/kg)
Volatiles			
Chloromethane	74-87-3	10	10
Bromomethane	74-83-9	10	10
Vinyl chloride	75-01-4	10	10
Chloroethane	75-00-3	10	10
Methylene chloride	75-09-2	5	5
Acetone	67-64-1	10	10
Carbon disulfide	75-15-0	5	5
1,1-Dichloroethene	75-35-4	5	5
1,1-Dichloroethane	75-34-3	5	5
1,2-Dichloroethene (total)	540-59-0	5	5
Chloroform	67-66-3	5	5
1,2-Dichloroethane	107-06-2	5	5
2-Butanone	78-93-3	10	10
1,1,1-Trichloroethane	71-55-6	5	5
Carbon tetrachloride	56-23-5	5	5
Vinyl acetate	108-05-4	10	10
Bromodichloromethane	75-27-4	5	5
1,2-Dichloropropane	78-87-5	5	5
cis-1,3-Dichloropropene	10061-01-5	5	5
Trichloroethene	79-01-6	5	5
Dibromochloromethane	124-48-1	5	5
1,1,2-Trichloroethane	79-00-5	5	5
Benzene	71-43-2	5	5
trans-1,3-Dichloropropene	10061-02-6	5	5
Bromoform	75-25-2	5	5
4-Methyl-2-pentanone	108-10-1	10	10
2-Hexanone	591-78-6	10	10
Tetrachloroethene	127-18-4	5	5
Toluene	108-88-3	5	5
1,1,2,2-Tetrachloroethane	79-34-5	5	5
Chlorobenzene	108-90-7	5	5
Ethyl benzene	100-41-4	5	5
Styrene	100-42-5	5	5
Xylenes (total)	1330-20-7	5	5

* Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.
Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, are calculated on a dry weight basis as required by the contract, and may be higher.

CAS Chemical abstract service.

** Analysis by USEPA Contract Laboratory Program Statement of Work for Organic Analysis, 2/88.

*** Analysis by USEPA Contract Laboratory Program Statement Work for Inorganic Analysis, Document Number ILMO1.0, 3/90.

ug/L Microgram per liter.

ug/kg Microgram per kilogram.

Table B-3. Target Compound List/Target Analyte List Parameters to be Analyzed for Sector B, and Sites L and M, Sauget - Cahokia, Illinois.

Parameter	CAS Number	Estimated Quantitation Limit* Water** (ug/L)	Soil** (ug/kg)
Semivolatiles			
Phenol	108-95-2	10	330
bis(2-Chloroethyl)ether	111-44-4	10	330
2-Chlorophenol	95-57-8	10	330
1,3-Dichlorobenzene	541-73-1	10	330
1,4-Dichlorobenzene	106-46-7	10	330
Benzyl alcohol	100-51-6	10	330
1,2-Dichlorobenzene	95-50-1	10	330
2-Methylphenol	95-48-7	10	330
2,2-oxybis(1-Chloropropane)	108-60-1	10	330
4-Methylphenol	106-44-5	10	330
N-Nitroso-di-n-dipropylamine	621-64-7	10	330
Hexachloroethane	67-72-1	10	330
Nitrobenzene	98-95-3	10	330
Isophorone	78-59-1	10	330
2-Nitrophenol	88-75-5	10	330
2,4-Dimethylphenol	105-67-9	10	330
Benzoic acid	65-85-0	50	1600
bis(2-Chloroethoxy)methane	111-91-1	10	330
2,4-Dichlorophenol	120-83-2	10	330
1,2,4-Trichlorobenzene	120-82-1	10	330
Naphthalene	91-20-3	10	330
4-Chloroaniline	106-47-8	10	330
Hexachlorobutadiene	87-68-3	10	330
4-Chloro-3-methylphenol	59-50-7	10	330
2-Methylnapthalene	91-57-6	10	330
Hexachlorocyclopentadiene	77-47-4	10	330
2,4,6-Trichlorophenol	88-06-2	10	330
2,4,5-Trichlorophenol	95-95-4	50	1600
2-Chloronaphthalene	91-58-7	10	330
2-Nitroaniline	88-74-4	50	1600
Dimethylphthalate	131-11-3	10	330
Acenaphthylene	208-96-8	10	330
2,6-Dinitrotoluene	606-20-2	10	330
3-Nitroaniline	99-09-2	50	1600
Acenaphthene	83-32-9	10	330
2,4-Dinitrophenol	51-28-5	50	1600
4-Nitrophenol	100-02-7	50	1600

* Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.
Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, are calculated on a dry weight basis as required by the contract, and may be higher.

CAS Chemical abstract service.

** Analysis by USEPA Contract Laboratory Program Statement of Work for Organic Analysis, 2/88.

*** Analysis by USEPA Contract Laboratory Program Statement Work for Inorganic Analysis, Document Number ILMO1.0, 3/90.

ug/L Microgram per liter.

ug/kg Microgram per kilogram.

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Table B-3. Target Compound List/Target Analyte List Parameters to be Analyzed for Sector B, and Sites L and M, Sauget - Cahokia, Illinois.

Parameter	CAS Number	Estimated Quantitation Limit*	
		Water** (ug/L)	Soil** (ug/kg)
Semivolatiles Con't			
Dibenzofuran	132-64-9	10	330
2,4-Dinitrotoluene	121-14-2	10	330
Diethylphthalate	84-66-2	10	330
4-Chlorophenyl-phenylether	7005-72-3	10	330
Fluorene	86-73-7	10	330
4-Nitroaniline	100-01-6	50	1600
4,6-Dinitro-2-methylphenol	534-52-1	50	1600
N-nitrosodiphenylamine	86-30-6	10	330
4-Bromophenyl-phenylether	101-55-3	10	330
Hexachlorobenzene	118-74-1	10	330
Pentachlorophenol	87-86-5	50	1600
Phenanthrene	85-01-8	10	330
Anthracene	120-12-7	10	330
Di-n-butylphalate	84-74-2	10	330
Fluoranthene	206-44-0	10	330
Pyrene	129-00-0	10	330
Butylbenzylphthalate	85-68-7	10	330
3,3-Dichlorobenzidine	91-94-1	10	660
Benzo(a)anthracene	56-55-3	10	330
Chrysene	218-01-9	10	330
bis(2-Ethylhexyl)phthalate	117-81-7	10	330
Di-n-octylphthalate	117-84-0	10	330
Benzo(b)fluoranthene	205-99-2	10	330
Benzo(k)fluoranthene	207-08-9	10	330
Benzo(a)pyrene	50-32-8	10	330
Indeno(1,2,3-cd)pyrene	193-39-5	10	330
Dibenz(a,h)anthracene	53-70-3	10	330
Benzo(g,h,i)perylene	191-24-2	10	330

*	Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable. Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, are calculated on a dry weight basis as required by the contract, and may be higher.
CAS	Chemical abstract service.
**	Analysis by USEPA Contract Laboratory Program Statement of Work for Organic Analysis, 2/88.
***	Analysis by USEPA Contract Laboratory Program Statement Work for Inorganic Analysis, Document Number ILMO1.0, 3/90.
ug/L	Microgram per liter.
ug/kg	Microgram per kilogram.

Table B-3. Target Compound List/Target Analyte List Parameters to be Analyzed for Sector B, and Sites L and M, Sauget - Cahokia, Illinois.

Parameter	CAS Number	Estimated Quantitation Limit* Water** (ug/L)	Soil** (ug/kg)
Pesticides/PCBs			
alpha-BHC	319-84-6	0.05	8.0
beta-BHC	319-85-7	0.05	8.0
delta-BHC	319-86-8	0.05	8.0
gamma-BHC (Lindane)	58-89-9	0.05	8.0
Heptachlor	76-44-8	0.05	8.0
Aldrin	309-00-2	0.05	8.0
Heptachlor epoxide	1024-57-3	0.05	8.0
Endosulfan I	959-98-8	0.05	8.0
Dieldrin	60-57-1	0.10	16.0
4,4'-DDE	72-55-9	0.10	16.0
Endrin	72-20-8	0.10	16.0
Endosulfan II	33213-65-9	0.10	16.0
4,4'-DDD	72-54-8	0.10	16.0
Endosulfan sulfate	1031-07-8	0.10	16.0
4,4'-DDT	50-29-3	0.10	16.0
Methoxychlor	72-43-5	0.50	80.0
Endrin ketone	53494-70-5	0.10	16.0
alpha-Chlordane	5103-71-9	0.05	80.0
gamma-Chlordane	5103-74-2	0.05	80.0
Toxaphene	8001-35-2	1.00	160.0
Aroclor-1016	12674-11-2	0.50	80.0
Aroclor-1221	11104-28-2	0.50	80.0
Aroclor-1232	11141-16-5	0.50	80.0
Aroclor-1242	53469-21-9	0.50	80.0
Aroclor-1248	12672-29-6	0.50	80.0
Aroclor-1254	11097-69-1	1.00	160.0
Aroclor-1260	11096-82-5	1.00	160.0

* Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.
Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, are calculated on a dry weight basis as required by the contract, and may be higher.

CAS Chemical abstract service.

** Analysis by USEPA Contract Laboratory Program Statement of Work for Organic Analysis, 3/90.

*** Analysis by USEPA Contract Laboratory Program Statememt Work for Inorganic Analysis, Document Number ILMO1.0, 3/90.

ug/L Microgram per liter.

ug/kg Microgram per kilogram.

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MCA 156983

GERAGHTY & MILLER, INC.

Table B-3. Target Compound List/Target Analyte List Parameters to be Analyzed for Sector B, and Sites L and M, Sauget - Cahokia, Illinois

Parameter	Estimated Quantitation Limit*** (ug/L)
Analyte	
Aluminum	200
Antimony	60
Arsenic	10
Barium	200
Beryllium	5
Cadmium	5
Calcium	5000
Chromium	10
Cobalt	50
Copper	25
Iron	100
Lead	3
Magnesium	5000
Manganese	15
Mercury	0.2
Nickel	40
Potassium	5000
Selenium	5
Silver	10
Sodium	5000
Thallium	10
Vanadium	50
Zinc	20
Cyanide	10

* Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.
Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, are calculated on a dry weight basis as required by the contract, and may be higher.

CAS Chemical abstract service.

** Analysis by USEPA Contract Laboratory Program Statement of Work for Organic Analysis, 2/88.

*** Analysis by USEPA Contract Laboratory Program Statement Work for Inorganic Analysis, Document Number ILMO1.0, 3/90.

ug/L Microgram per liter.

ug/kg Microgram per kilogram.

DRAFT

MCA 156934

ANAPARA.XLS

Table B-4. Sample Containers and Preservation for Target Compound List/Target Analyte List (TCL/TAL) and Toxicity Characteristics Leaching Procedure (TCLP) Parameters for Sector B, and Sites L and M, Sauget - Cahokia, Illinois.

Matrix	Parameter	Analytical Method	Sample Container(s) (a)	Chemical Preservative (b)	Holding Time (c)
Water	Volatiles	CLP	(4) 40 ml glass vial.	Hydrochloric acid, pH<2	10 days
Water	Semivolatiles, Pesticides/PCBs	CLP	(3) 1 liter glass bottle.	Unpreserved.	Extraction-5 days Analysis-40 days following extraction
Water	Metals	CLP	(1) 500 ml plastic bottle.	Nitric acid, pH<2	Mercury-26 days Metals (other than Mercury) 180 days
Water	Cyanide	CLP	(1) 1 liter plastic bottle.	Sodium hydroxide, pH>12	12 days
Sediment/Fill	Volatile Organic Compounds	CLP	(2) 40 ml glass vial.	Unpreserved.	10 days
Sediment/Fill	Semivolatiles, Pesticides/ PCBs,	CLP	(1) 500 ml glass jar.	Unpreserved.	Extraction-10 days Analysis-40 days following extraction
Sediment/Fill	Metals	CLP	(1) 500 ml plastic jar.	Unpreserved.	Mercury-26 days Metals (other than Mercury) 180 days
Sediment/Fill	Cyanide	CLP	(1) 500 ml plastic jar.	Unpreserved.	12 days
Sediment/Fill	Ignitability	SW-846 Method 1010 M(d)	(1) 500 ml glass jar.	Unpreserved	-
	Corrositivity	SW-846 Method 9045	(1) 500 ml plastic jar.	Unpreserved	-
	Reactivity	SW-846 Method 9010/9030	(1) 500 ml plastic jar.	Unpreserved	-

(a) Sample containers will be of demonstrated cleanliness as described in the laboratory QAPP.
(b) Samples will be cooled to approximately 4 C.
(c) Starts from verified time of sample receipt except where noted.
(d) Method 1010 is modified by the laboratory for solid samples.
SW Solid Waste.
CLP Contract Laboratory Protocols.

MCA ~156985

TARLIST XLS

Table B-4. Sample Containers and Preservation for Target Compound List/Target Analyte List (TCL/TAL) and Toxicity Characteristics Leaching Procedure (TCLP) Parameters for Sector B, and Sites L and M, Sauget - Cahokia, Illinois.

Matrix	Parameter	Analytical Method	Sample Container(s) (a)	Chemical Preservative (b)	Holding Time (c)
Sediment/Fill	TCLP Volatiles	SW-846 Method 8240	(2) 4 oz amber glass container.	Unpreserved	TCLP Extraction-14 days from time of collection Analysis-14 days following extraction
Sediment/Fill	TCLP Semivolatiles	SW-846 Method 8270	(1) 500 ml glass jar.	Unpreserved	TCLP Extraction-7 days from time of collection Preparation Extraction-7 days following TCLP Extraction Analysis-40 days following preparation extraction
Sediment/Fill	TCLP Pesticides	SW-846 Method 8080	(1) 500 ml glass jar.	Unpreserved	TCLP Extraction-7 days from time of collection Preparation Extraction-7 days following TCLP Extraction Analysis-40 days following preparation extraction
Sediment/Fill	TCLP Herbicides	SW-846 Method 8150	(1) 500 ml glass jar.	Unpreserved	TCLP Extraction-7 days from time of collection Preparation Extraction-7 days following TCLP Extraction Analysis-40 days following preparation extraction
Sediment/Fill	TCLP Metals	SW-846 Method 6010 and 7470	(1) 500 ml glass jar.	Unpreserved	Mercury-TCLP Extraction-28 days from time of collection Analysis-28 days following Extraction Metals (other than Mercury) TCLP Extraction-180 days from time of collection Analysis-180 days following extraction

(a) Sample containers will be of demonstrated cleanliness as described in the laboratory QAPP.
(b) Samples will be cooled to approximately 4 C.
(c) Starts from verified time of sample receipt except where noted.
(d) Method 1010 is modified by the laboratory for solid samples.
SW Solid Waste.
CLP Contract Laboratory Protocols.

DRAFT

MCA 0156986

TARLIST.XLS

APPENDIX C

MCA 0156987

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APPENDIX C

HEALTH AND SAFETY PLAN FOR THE SITE INVESTIGATION FOR DEAD CREEK - SECTOR B, AND SITES L AND M, SAUGET-CAHOKIA, ILLINOIS

GERAGHTY & MILLER, INC

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HEALTH AND SAFETY PLAN FOR THE SITE INVESTIGATION FOR DEAD CREEK - SECTOR B, AND SITES L AND M, SAUGET-CAHOKIA, ILLINOIS

INTRODUCTION

Geraghty & Miller, Inc. has been authorized by Monsanto Company to conduct a site investigation for Dead Creek - Sector B, Site L, and Site M. The purpose of this investigation is to characterize the sites by determining the nature and extent of sediment/fill materials Sector B and Site L, and below the ponded water at Site M. This Health and Safety Plan (HASP) has been developed to address the potential physical and chemical hazards that the workers may face while performing the planned field activities. It establishes procedures to minimize worker's exposures though personal protective equipment and safe work practices. This HASP has been developed to meet the requirements of the Occupational Safety and Health Administration (OSHA) regulation, Title 29, Code of Federal Regulations, Part 1910.120 (20 CFR 1910.120), "Hazardous Waste Operations and Emergency Response." It is intended for the protection of our workers. Anyone else, such as subcontractors, client, and visitors may review our HASP and follow its procedures if they decide to do so freely.

RESPONSIBILITIES

The on-site hydrogeologist will be designated as the Site Safety Officer (SSO). He/she will be responsible for implementing the procedures and safe work practices established in this HASP. In the event that the SSO must leave the site while the work is in progress, an alternate SSO will be designated to ensure that the HASP will continued to be followed. The SSO will report all health and safety matters to the project manager, Brian Blum, who has responsibility for overseeing the planned activities. Tom Eng, Northeast Health and Safety Manager, will be available on an as needed basis. Dennis Colton is the Project Director for this investigation and has overall responsibility.

SITE DESCRIPTION

Dead Creek - Sector B

Dead Creek - Sector B is located between Queeny Avenue and Judith Lane. The culverts at both ends of Sector B have been sealed to prevent inflow and outflow. The creek area consists of a narrow channel about 5 feet wide. The creek is flanked by banks on both sides. The banks are heavily vegetated and debris is visible in the area. The entire site is enclosed within a chain link fence. Previous studies conducted by IEPA in 1980 and Ecology & Environment, Inc. in 1986, indicated the presence of metals, organic compounds, and PCBs.

Site L

Site L was formerly used as a surface impoundment area by a trucking company. Site L is located approximately 700 feet south of Queeny Avenue and 125 feet east of Dead Creek. It encompasses an area of approximately 145 feet by 195 feet. Currently, the site is covered by black cinders and is used for equipment storage by Metro Construction Equipment. Previous studies conducted by IEPA in 1980 and Ecology & Environment,Inc. in 1986, indicated the presences of compounds such as benzene, toluene, phenols, and arsenic.

Site M

Site M is a former sand excavation pit. The pit is approximately 235 feet by 335 feet and is filled with water estimated to be 10 feet in depth. The pit is located on the east side of Dead Creek - Sector B, slightly north of Judith Lane. The site is enclosed by a chain link fence. While there is no evidence of waste disposal at this site, previous studies conducted by IEPA in 1980 and Ecology & Environment in 1986, indicated that PCBs were found in surface water and sediments.

For additional information and details of each site, refer to the Work Plan, Section 1.2.1, Site Location and Description.

PLANNED FIELD ACTIVITIES

The following is a brief description of the planned field activities for Dead Creek - Sector B, Sites L and M:

Dead Creek: Sector B: Sediment/fill boring program for the collection of samples throughout the 2,000 foot length of sector B.

Site L: Boring program for the collection of fill material samples.

Site M: Boring program for the collection of sediment samples at the bottom of the pond.

For additional details of the planned field activities at each site, refer to the Field Sampling Plan, Appendix A.

HAZARD EVALUATION

The potential hazards, physical and chemical, associated with the planned field activities for the three sites listed above have been evaluated. Existing information such as the task which will be performed, past site experience, site history, and past sampling results, were all used in this evaluation process.

The physical hazards associated with the planned field activities included the potential for being struck by flying and falling objects while working near the drill rig. Being splashed with potentially harmful liquids. Slips and falls due to wet or uneven surfaces. Heat Stress may also be a factor as portions of the planned field activities may occur when ambient temperatures are high.

The chemical hazards associated with this site are based on the past sampling results obtained from the IEPA Study (St. John 1981) and the Ecology & Environment, Inc. Study (E&E 1988). The studies state that Volatile Organic Compounds (VOCs) such as Benzene, Toluene, were found at Dead Creek - Sector B and Site L. Metals were also found at both of these sites. PCBs were found in Dead Creek - Sector B and Site M.

Phosphorus is a compound that has been reported at the Dead Creek - Sector B site in the past (St. John 1981). The associated health hazards of this compound are addressed through the use of personal protective equipment and safe work practices. In addition, phosphorus will autoignite, at 86°F (30°C). As a precautionary measure, a thermometer will be present at the site at all times, and should ambient temperatures meet or exceed 80°F (27°C). Work will be permitted in wet areas only.

Based upon this information, the following exposure pathways have been identified in order to minimize potential worker's exposure:

- Inhalation of vapors and gasses.
- Direct skin contact with vapors, liquids, soil, and sediments.
- Accidental ingestion of contaminants.
- Absorption through the skin due to the presences of compounds such as PCBs and phenol.

AIR MONITORING

Air monitoring will be conducted at these site during all planned field activities in order to ensure that the workers are appropriately protected from the potential chemical hazards. An intrinsically safe Photo-Ionization Detector (PID) will be used. This instrument is designed to measure trace quantities of VOCs in air and has a parts per million (PPM) sensitivity range. This instrument will be calibrated each morning, before field use, and calibration records will be kept. In addition, Draeger tubes for Benzene will also be available to confirm this compounds concentration at the sites.

ACTION LEVELS

Based upon our knowledge of these site and it's constituents, the following action level procedure has been established for all planned field activities in order to evaluate whether actual field conditions will require an upgrade in the level of protection. For each task, air monitoring using the PID instrument will be conducted. An action level of 1 PPM needle deflection above background for a sustained period of 5 minutes in the worker's breathing zone has been established based on the presences of Benzene. Table 1, Current Occupational Airborne Contaminant Standards and Guidelines, provides a listing of the predominant VOCs found at these sites and their current occupational exposure limits. If the action level is exceeded, a second step using a Draeger tube for Benzene be drawn to confirm whether Benzene concentrations meet or exceed 1 PPM in the worker's breathing zone. If the action level is exceeded, work will be discontinued, the work area will be permitted to vent and the workers moving to an area up wind, work will not resume until the Benzene concentrations fall below the action level. If after a maximum of 30 minutes, the concentration of Benzene does not fall below the action level, then the work will resume with the level of protection upgrade to level C using a full face air purifying respirator equipped with an organic vapor cartridges. Once in level C, Benzene tubes will be drawn every 30 minutes to monitor its presences. When this monitoring indicates that the concentration is below the action level, then downgrading to Level D is possible. The level of protection will also be upgraded to Level C when the PID instrument measures 5 PPM above background for a sustained period of 5 minutes for total VOC concentrations when benzene concentrations are below 1 PPM. The work will also be stop if Benzene concentrations meet or exceed 50 PPM, work cannot resume until benzene concentrations fall below 50 PPM.

LEVELS OF PROTECTION

Based upon the hazard evaluation results, all tasks will be performed in level D protection. In the event that the established action level for Benzene is exceeded, the level of protection will be upgrade to level C. The following is a description of the personal protective equipment required for each level:

Level D

- Hard Hat
- Disposable coveralls (optional)
- Safety glasses, goggles, or faceshield
- Steel-toe and shank, work boots
- Chemically resistant outer boots
- Chemical-resistant gloves (necessary when handling soil, sediment or surface water)
- Hearing protection, NRR of 35 decibels (optional)
- Life vest must be worn when working in the pond at Site M.

Level C

- Full face air purifying respirator equipped with organic vapor cartridges
- Hard hat
- Disposable coveralls (optional)
- Safety glasses, goggles, or faceshield
- Steel-toe and shank, boots
- Chemically resistant outer boots
- Chemical-resistant gloves (optional except when handling soil, sediment or surface water)

- Hearing protection, NRR of 35 decibels (optional)
- Life vest must be worn when working in the pond at Site M.

SITE CONTROL

Prior to the start of the field activities, the SSO will be responsible for the designation of the work, support, and clean zones. The work zone will be an area surrounding the immediate work being performed where the greatest potential hazards exist. Only the necessary workers required to performed the work will be permitted in this zone. A support zone will be established for the storage of equipment and personnel decontamination. A clean zone will be established for site control of visitors, equipment deliveries, and communications.

Dead Creek - Sector B and Site M have perimeter fencing and therefore, site access by authorized and unauthorized personnel will be controlled. Site L has no perimeter fencing and so the SSO will take additional measures to secure the work area, such as roping off the immediate work area and/or postings warnings signs, in order to deter unauthorized personnel from gaining access to the work area.

DECONTAMINATION

A personnel decontamination station will be established in the support zone. Personnel decontamination will consist of brush cleaning potentially contaminated items, such as boots and gloves with a mild soap and water solution and a water rinse. All personnel leaving the work zone will go though the decontamination process before leaving the work area.

SAFE WORK PRACTICES

- All Geraghty & Miller site personnel will be participants of the company's health and safety program. This includes 40 hours of initial training, annual 8 hour refresher training and 8 hour manager and supervisor training.

- All Geraghty & Miller site personnel are participants of the company's medical surveillance program.

- A copy of the HASP will be available for reference at the site during the planned field activities.

- Dust suppression, using a water spray, will be used when needed to reduce airborne particulates during the field activities. If a water spray cannot be used or is ineffective, workers will use particle respirators or particle/mist cartridges and their full face respirators.

- A pre-entry, tailgate safety meeting will be conducted prior to the start of each task to discuss the associated hazards.

- The SSO will inform all subcontractors of the potential hazards associated with the site and the planned field activities. A copy of the HASP will be made available for their review.

- No eating, drinking, and smoking will be permitted in the work and support zones.

- No sources of ignition, such as matches or lighters will be permitted in the work and support zones.

- The buddy system will be used in all work areas.

- During hazardous weather conditions, such as lightning and thunder storms, work will cease immediately.

Heat Stress

As portions of this job may be conducted during the summer months when ambient temperatures may be high, the following procedures will be followed to recognize and prevent heat stress. The SSO will monitor the activities of the workers and the conditions of the work environment. The SSO will monitor the workers for initial signs of heat stress which include: dizziness, nausea, inability to concentrate, impaired performance, and loss of coordination. The following preventive measures will be taken:

- Increase the number of rest periods. Rest areas will be designated by the SSO in shaded areas and when possible in air conditioned environments, such as trailers, and cars.

- Potable water will be available and all workers will be encouraged to drink throughout the day.

- Adjustment of the work schedule will be made, when possible, to conduct labor intensive tasks during the early morning or later afternoon hours.

EMERGENCY PLAN

Verbal communications may be difficult at times due to personal protective equipment and noise. A universal set of hand signals will then be used. They are as follows:

Hand gripping throat:	Can't breath
Grip partner's wrist or place hands around waist:	Leave work area immediately
Hand on top of head:	Need assistance
Thumbs up:	Ok, I'm all right
Thumbs down:	No, Negative

All job-related injuries and illnesses will be reported to the SSO. If medical attention is needed, the injured worker will be decontaminated, if possible, prior to leaving the site. The SSO will investigate the cause of the accident and corrective measures will be taken before the work can resume. It will be the responsibility of the SSO to complete the accident reporting form, OSHA 101, included in this report for all injuries. The completed OSHA 101 should be forwarded to the office health and safety manager within six days for recording into the OSHA 200 log. In the event of a fatality or 5 or more workers hospitalized as a result of a single incident, the SSO will contact the office health and safety manager immediately for OSHA reporting purposes.

EMERGENCY TELEPHONE NUMBERS

Police	-	(618) 277-3500
Fire	-	(618) 332-6600
Ambulance	-	(618) 332-6793
Gateway Community Hospital	-	(618) 874-7076

DIRECTIONS TO THE HOSPITAL

Leave the work site and proceed north on Falling Springs Road via Judith Lane or Walnut Avenue. Proceed on Falling Springs Road into East St. Louis (turns into 19th Street). Proceed north on 19th Street to Bond Avenue, west on Bond Avenue to 15th Street, proceed north on 15th Street to King Drive. Go east on King Drive to Gateway Community Hospital.

IA:BLMHASP

Table C-1. Current Occupational Airborne Contaminants Standards and Guidelines

	ACGIH-TLV (PPM)		OSHA-PEL (ppm)	
	TWA	STEL	TWA	STEL
Benzene	10		1	
Phenol	5		5	
Toluene	100	150	100	125
Trichloroethylene	50	200	50	200
Tetrachlorothylene	50	200	25	--
Chlorobenzene	75	--	75	--
Ethylbenzene	100	125	100	125
Xylene	100	150	100	150

ACGIH - American Conference of Governmental Industrial Hygienists, 1990-1991
OSHA - Occupational Safety and Health Administration, 1989
TLV - Threshold Limit Value
PEL - Permissible Exposure Limit
TWA - 8 Hour Time Weighted Average
STEL - 15 Minute Short Term Exposure Limit
PPM - Parts Per Million

ATTACHMENT C-A

SITE VISITORS LOG

VISITOR REVIEW OF SITE HEALTH AND SAFETY PLAN

THE UNDERSIGNED VISITORS REQUIRE ENTRANCE TO THE EXCLUSION ZONE AND HAVE THOROUGHLY READ THE HEALTH AND SAFETY PLANS, UNDERSTAND THE POTENTIAL HAZARDS AT THE SITE AND THE PROCEDURES TO MINIMIZE EXPOSURE TO THE HAZARDS, WILL FOLLOW THE DIRECTION OF THE SITE HEALTH AND SAFETY OFFICER, AND WILL ABIDE BY THE HEALTH AND SAFETY PLAN.

NAME (PRINT)	COMPANY	DATE	SIGNATURE

MCA 0157013

ATTACHMENT C-8

TAILGATE SAFETY MEETING FORM

Geraghty & Miller

TAILGATE SAFETY MEETING

Prepared by ______________

Client ______________ Project ______________

Date ______________ Project Number ______________

Work Location ______________

Type of Work to be Done ______________

SAFETY TOPICS PRESENTED

Chemical Hazards ______________

____

Physical Hazards/Underground Utilities ______________

____

Protective Clothing/Equipment ______________

____

Special Equipment ______________

Emergency Procedures ______________

____

Hospital/Clinic ______________ Phone (   ) ______________

Paramedic Phone (   ) ______________

Hospital Address ______________

Other ______________

ATTENDEES

NAME PRINTED	SIGNATURE

Meeting Conducted By ______________ ______________
Name Printed Signature

Note: This tailgate safety form must be completed daily.

ATTACHMENT C-C

ACCIDENT REPORTING FORM, OSHA 101

OSHA No. 101
Case or File No. ....

Form approved
OMB No. 44R 1453

Supplementary Record of Occupational Injuries and Illnesses

EMPLOYER

1. Name ....
2. Mail address .... (No. and street) (City or town) (State)
3. Location, if different from mail address ....

INJURED OR ILL EMPLOYEE

4. Name .... Social Security No. .... (First name) (Middle name) (Last name)
5. Home address .... (No. and street) (City or town) (State)
6. Age .... 7. Sex: Male............ Female............ (Check one)
8. Occupation .... (Enter regular job title, *not* the specific activity he was performing at time of injury.)
9. Department .... (Enter name of department or division in which the injured person is regularly employed, even though he may have been temporarily working in another department at the time of injury.)

THE ACCIDENT OR EXPOSURE TO OCCUPATIONAL ILLNESS

10. Place of accident or exposure .... (No. and street) (City or town) (State)
If accident or exposure occurred on employer's premises, give address of plant or establishment in which it occurred. Do not indicate department or division within the plant or establishment. If accident occurred outside employer's premises at an identifiable address, give that address. If it occurred on a public highway or at any other place which cannot be identified by number and street, please provide place references locating the place of injury as accurately as possible.
11. Was place of accident or exposure on employer's premises? .... (Yes or No)
12. What was the employee doing when injured? .... (Be specific. If he was using tools or equipment or handling material, name them and tell what he was doing with them.)
....
13. How did the accident occur? .... (Describe fully the events which resulted in the injury or occupational illness. Tell what happened and how it happened. Name any objects or substances involved and tell how they were involved. Give full details on all factors which led or contributed to the accident. Use separate sheet for additional space.)

OCCUPATIONAL INJURY OR OCCUPATIONAL ILLNESS

14. Describe the injury or illness in detail and indicate the part of body affected. .... (e.g.: amputation of right index finger at second joint; fracture of ribs; lead poisoning; dermatitis of left hand, etc.)
15. Name the object or substance which directly injured the employee. (For example, the machine or thing he struck against or which struck him; the vapor or poison he inhaled or swallowed; the chemical or radiation which irritated his skin; or in cases of strains, hernias, etc., the thing he was lifting, pulling, etc.)
....
....
16. Date of injury or initial diagnosis of occupational illness .... (Date)
17. Did employee die? .... (Yes or No)

OTHER

18. Name and address of physician ....
19. If hospitalized, name and address of hospital ....
....

Date of report .... Prepared by ....
Official position ....